# Volume III

# Supporting Appendices
# of the
# Final
# Environmental Impact Statement for
# Activities Associated with Future Programs at
# U.S. Army Dugway Proving Ground

**U.S. Army Dugway Proving Ground**
**Dugway, UT 84022-5000**

**April 30, 2003**

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**April 30, 2003**

## TABLE OF CONTENTS



## LIST OF TABLES

# Table of Contents



## LIST OF FIGURES

| | |
|---|---|
| °C | degrees Celsius |
| > | greater than |
| < | less than |
| µg/L | micrograms per liter |
| TM | trademark |

**A**

| | |
|---|---|
| AAFES | Army and Air Force's Exchange System |
| ABP | agent breakdown product |
| ACTD | Advanced Concept Technology Demonstration |
| ACWA | Assembled Chemical Weapons Assessment |
| AF | Air Force |
| AHU | Air Handling Unit |
| AIRFA | American Indian Religious Freedom Act |
| AO | Approval Order |
| AOC | area of concern |
| AR | Army Regulation |
| Army | U. S. Army |
| ARPA | Archaeological Resources Protection Act |
| AST | above ground storage tank |
| Avery | Avery Technical Center |

**B**

| | |
|---|---|
| Baker | Baker Area |
| BG | *Bacillus subtilus* var. *niger* |
| BL | biosafety level |
| BMTF | Bushnell Materiel Test Facility |
| BT | *Bacillus thuringiensis* |
| BZ | 2-quinuclidinyl benzilate |

**C**

| | |
|---|---|
| CAA | Clean Air Act |
| CAIRA | Chemical Accident/Incident Response and Assistance |
| CALCM | Conventional Air Launched Cruise Missile |
| Carr | Carr Facility |
| CAWMP | Chemical Agent Waste Management Plan |
| CB | *Coxiella burnetii* |
| CBR | Chemical Biological-Radiological |
| CCTF | Reginald Kendall Combined Chemical Test Facility |
| CDC | Center for Disease Control |
| CG | phosgene |
| CGWMP | Comprehensive Groundwater Monitoring Plan |
| CHWSF | Central Hazardous Waste Storage Facility |
| cm | centimeter(s) |
| Co | county |
| COE | U.S. Army Corps of Engineers |
| CRMO | Cultural Resource Management Officer |

| | |
|---|---|
| CS | o-chlorobenzylidene malonitrile, also popularly known as “tear gas” |
| CWA | Clean Water Act |

**D**

| | |
|---|---|
| DCP | Disaster Control Plan |
| DEM | diethyl malonate |
| Ditto | Ditto Technical Center |
| DOD | Department of Defense |
| DPG | U.S. Army Dugway Proving Ground |
| DPGR | DPG Regulation |
| DTC | Defensive Test Chamber |
| DWSP | Drinking Water Source Protection |

**E**

| | |
|---|---|
| EH | *Erwinia herbicola* |
| EIS | environmental impact statement |
| EO | Executive Order |
| EOD | Explosive Ordnance Disposal |
| EPA | U.S. Environmental Protection Agency |
| ESA | Endangered Species Act |

**F**

| | |
|---|---|
| FAT | final acceptance test |
| FEIS | Final EIS |
| ft | foot or feet |
| $ft^3$ | cubic foot or feet |
| FUDS | Formerly Used Defense Sites |

**G**

| | |
|---|---|
| g | gram(s) |
| GA | ethyl N,N-dimethylphosphoroamidocyanidate (or Tabun) |
| GB | isopropyl methylphosphonofluoridate (or Sarin) |
| GC | gas chromotography |
| GD | pinacolyl methylphosphonofluoridate (or Soman) |
| GF | cyclohexyl methylphosphonofluoridate (or Cyclosarin) |
| GPI | Granite Peak Installation |

**H**

| | |
|---|---|
| H | Levinstein Mustard |
| HAP | hazardous air pollutant |
| HC | hexachloroethane |
| HD | bis(2-chloroethyl) sulfide (or Distilled Mustard) |
| HEPA | high-efficiency particulate air |
| HIV | Human Immunodeficiency Virus |
| HMX | cyclo-1,3,5,7-tetramethylene 2,4,6,8-tetranitramine (or High Melting Explosive) |
| HP | High Probability Cultural Resource Area |

| | |
|---|---|
| HT | bis(2-chloroethylthioethyl) ether mixture (or Distilled Levinstein Mustard) |
| HWMP | Hazardous Waste Management Plan |
| HWMU | hazardous waste management unit |

**I**

| | |
|---|---|
| ICRMP | Integrated Cultural Resources Management Plan |
| ICUZ | Installation Compatible Use Zones |
| INRMP | Integrated Natural Resource Management Plan |
| IRP | Installation Restoration Program |
| ITAM | Integrated Training Area Management |

**J**

| | |
|---|---|
| JDAM | Joint Direct Attack Munitions |
| JSOW | Joint Standoff Weapon |

**K**

| | |
|---|---|
| kg | kilogram(s) |
| km | kilometer(s) |
| kW | kilowatt(s) |

**L**

| | |
|---|---|
| L | liter(s) |
| LALSR | Low Altitude Large Scale Reconnaissance |
| LAT | lot acceptance test |
| lb | pound(s) |
| LC | lethal concentration |
| LC50 | lowest concentration that results in death of 50 percent of animals |
| LCLo | lowest concentration |
| LD | lethal dose |
| LD50 | lethal dose that results in death of 50 percent of animals |
| LDLo | lowest dose |
| LSTF | Lothar Salomon Life Sciences Test Facility |

**M**

| | |
|---|---|
| m | meter(s) |
| $m^3$ | cubic meter(s) |
| MAAF | Michael Army Airfield |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| $mg/m^3$ | milligrams per cubic meter |
| mi | mile(s) |
| min | minute(s) |
| mm | millimeter(s) |
| MS | mass spectrometry |
| MS2 | Bacteriophage MS2 |
| MTAMP | Maneuver Training Area Management Plan |

**N**

| | |
|---|---|
| NA | not applicable |
| NaCl | sodium chloride |
| NAGPRA | Native American Graves Protection and Repatriation Act |
| NASA | National Aeronautics and Space Administration |
| ND | not detected |
| NEPA | National Environmental Policy Act |
| NG | National Guard |
| NHPA | National Historic Preservation Act |
| No. | number |
| NRHP | National Register for Historic Places |
| NTU | Nephelometric Turbidity Units |

**O**

| | |
|---|---|
| OB | open burning |
| OD | open detonation |
| OB/OD | Open Burn/Open Detonation |
| ODOBi | Open Detonation/Open Burn, Improved |
| OSHA | Occupational Safety and Health Administration |
| OVA | Ovalbumin |

**P**

| | |
|---|---|
| PAM | pamphlet |
| PAS | Pollution Abatement System |
| PCB | polychlorinated biphenyl |
| pCi/L | picocuries per liter |
| $PM_{10}$ | particulate matter less than 10 microns |
| POL | petroleum, oil, and lubricants |

**Q**

| | |
|---|---|
| QAPP | Quality Assurance Program Plan |

**R**

| | |
|---|---|
| R | Rule |
| RCRA | Resource Conservation and Recovery Act |
| RDX | cyclo-1,3,5-trimethylene-2,4,6-trinitramine |
| RFA | RCRA Facility Assessment |
| RFI | RCRA Facility Investigation |
| RP | red phosphorus |
| RRM | range recovered munition |
| RTECS | Registry of Toxic Effects of Chemical Substances |

**S**

| | |
|---|---|
| SDP | Summary Development Plan |
| SDWA | Safe Drinking Water Act |

| | |
|---|---|
| SEB | Staphylococcal enterotoxin B |
| $SF_6$ | sulfur hexafluoride |
| SOP | standing operating procedure |
| SPCCP/ISCP | Spill Prevention, Control, and Countermeasures Plan/Installation Spill Contingency Plan |
| sq | square |
| SVOC | semi-volatile organic compound |
| SWMU | solid waste management unit |

**T**

| | |
|---|---|
| T | total |
| TAFAS | Toxic Agent Filter Abatement System |
| TCLo | lowest toxic concentration |
| TDLo | lowest toxic dose |
| TEP | triethyl phosphate |
| TM | technical manual |
| TOC | total organic carbon |
| TOX | total organic halogens |
| TPAD | Thermal Pollution Abatement Device |
| TPH | total petroleum hydrocarbons |
| TSCA | Toxic Substance Control Act |

**U**

| | |
|---|---|
| UDAQ | Utah Division of Air Quality |
| UDSHW | Utah Division of Solid and Hazardous Waste |
| U.S. | United States |
| U.S.C. | United States Code |
| USDA | U.S. Department of Agriculture |
| UST | underground storage tank |
| UXO | unexploded ordnance |

**V**

| | |
|---|---|
| VEE | Venezuelan equine encephalomyelitis |
| VOC | volatile organic compound |
| VX | O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate |

**W**

| | |
|---|---|
| WP | white phosphorus |

**Y**

| | |
|---|---|
| $yd^3$ | cubic yard(s) |

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX A*

*List of Environmental Laws, Permits, and Management Plans*

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# List of Environmental Laws, Permits, and Management Plans

Appendix A presents a list of environmental laws, permits, and management plans that are applicable to operations at U.S. Army Dugway Proving Ground.

## A1.0 Laws

This section lists Federal and state environmental laws, EOs, and Army regulations that apply to DPG's operations. These laws, EOs, and Army regulations are presented by the resource areas analyzed in the EIS and include utilities and support infrastructure. Popular names for Federal laws are from citations of the Law Revision Council of the U.S. House of Representatives.

### General

- Environmental Quality Improvement Act of 1970
  42 U.S.C. 4371-4375
- Federal Facility Compliance Act of 1992
  42 U.S.C. 6901 note, 6903, 6927, 6939e, and 6961
- Freedom of Information Act of 1966
  5 U.S.C. 552
- NEPA of 1969
  42 U.S.C. 4321
- National Environmental Education Act of 1990
  20 U.S.C. 5501
- Pollution Prevention Act of 1990
  42 U.S.C. 13101 et seq.
- Administration of the CAA and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans
  EO 11738
- Federal Acquisition and Community Right-To-Know
  EO 12969
- Federal Compliance with Pollution Control Standards
  EO 12088 as amended by EO 12580
- Federal Compliance with the Right-to-Know Laws and Pollution Prevention Requirements
  EO 12856
- Intergovernmental Review of Federal Programs
  EO 12372 as amended by EO 12416
- Protection and Enhancement of Environmental Quality
  EO 11514 as amended by EO 11991

- Environmental Effects of Army Actions
  AR 200-2
- Environmental Protection and Enhancement
  AR 200-1
- Preventive Medicine, Chapter 11 – Environmental Quality
  AR 40-5

### Water Resources

- Federal Water Pollution Control Act of 1948
  Commonly referred to as the Clean Water Act of 1977
  33 U.S.C. 1251 et seq.
- SDWA of 1974
  42 U.S.C. 300f through 300j
- Water Quality Act
  Utah Code Annotated 19-5-101 – 120
- SDWA
  Utah Code Annotated 19-4-101 – 112
- Protection of Wetlands
  EO 11990 as amended by EO 12608
- Administration Rules for Water Well Drillers
  State of Utah, R-655-4
  Adopted 19 Jan. 1995.

## Air Resources

- CAA of 1955
  42 U.S.C. 7401 et seq.
- Other popular act names associated with the sections of the CAA:
  - National Emission Standards Act
  - CAA Amendments of 1966
  - Air Quality Act of 1967

- Clean Air Amendments of 1970
- CAA Amendments of 1977
- CAA Amendments of 1990

♦ Utah Air Conservation Act
Utah Code Annotated 19-2-101 – 127

♦ Procurement Requirements and Policies for Federal Agencies for Ozone-Depleting Substances
EO 12843

## Biological Resources

♦ Bald Eagle Protection Act of 1940
Amended in 1962 to include the Golden Eagle
16 U.S.C. 668 et seq.

♦ Endangered Species Act of 1973
16 U.S.C. 1531 et seq.

♦ Federal Cave Resources Protection Act of 1988
16 U.S.C. 4301

♦ Federal Insecticide, Fungicide, and Rodenticide Act of 1947
7 U.S.C. 136

♦ Federal Noxious Weed Act of 1974
7 U.S.C. 2801 et seq.

♦ Fish and Wildlife Conservation Act of 1980
16 U.S.C. 2901 et seq.

♦ Fish and Wildlife Coordination Act of 1934
16 U.S.C. 661 through 666c

♦ Migratory Bird Treaty Act of 1918
16 U.S.C. 703 et seq.

♦ NEPA of 1969
42 U.S.C. 4321

♦ Sikes Act of 1960
Sikes Act Amendments of 1978

Sikes Improvement Act of 1997
16 U.S.C. 670

- Wild Free-Roaming Horses and Burros Act of 1971
  16 U.S.C. 1331 et seq.
- Utah Noxious Weed Act
  Utah Code Annotated 4-17
- Utah Seed Act
  Utah Code Annotated 4-16
- Invasive Species
  EO 13112
- Protection of Wetlands
  EO 11990 as amended by EO 12608
- ITAM
  AR 350-4
- Natural Resources
  AR 200-3
- Pest Management
  AR 200-5

## Socioeconomics

- Americans with Disabilities Act of 1990
  42 U.S.C. 12101 et seq.
- Architectural Barriers Act of 1968
  42 U.S.C. 4151 et seq.

## Environmental Justice

- Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
  EO 12898 as amended by EO 12948

## Land Use and Access

- Federal Cave Resources Protection Act of 1988
  16 U.S.C. 4301
- Federal Land Policy and Management Act of 1976
  43 U.S.C. 1701 et seq.

- Federal Noxious Weed Act of 1974
  7 U.S.C. 2801 et seq.
- Acquisition of Public Lands for use by the War Department as a Chemical Warfare Range
  EO 9053
- Invasive Species
  EO 13112
- Use of Off-Road Vehicles on Public Lands
  EO 11644 as amended by EO 11989 and EO 12608
- Acquisition of Real Property and Interests Therein
  AR 405-10
- Disposal of Real Estate
  AR 405-90
- Management of Title and Granting Use of Real Estate
  AR 405-80
- Master Planning for Army Installations
  AR 210-20

## Cultural and Historic Resources

- AIRFA of 1978
  42 U.S.C. 1996
- Antiquities Act of 1906
  16 U.S.C. 431-433
- ARPA of 1979
  16 U.S.C. 470aa-mm
- NHPA of 1966
  16 U.S.C. 470-w6
- NAGPRA of 1990
  25 U.S.C. 3001-13
- Indian Sacred Sites
  EO 13007
- Protection and Enhancement of the Cultural Environment
  EO 11593

- Cultural Resources Management
  AR 200-4
- Historic Preservation
  AR 420-40
- Army Museums, Historical Artifacts, and Art
  AR 870-20

## Traffic and Transportation

- Army Aviation: Flight Regulations
  AR 95-1
- Defense Traffic Management Regulation
  AR 55-355
- Performance Oriented Packing of Hazardous Materials
  AR 700-143
- Prevention of Motor Vehicle Accidents
  AR 385-55
- Operational Procedures for Aircraft Carrying Hazardous Materials
  AR 95-27
- Responsibilities for Technical Escort of Dangerous Materials
  AR 740-32

## Visual Resources

CAA of 1955
42 U.S.C. 7401 et seq.

## Noise

- Noise Control Act of 1972
  42 U.S.C. 4901
- Noise Pollution Abatement Act of 1970
  42 U.S.C. 1858, 1858a
- Quiet Communities Act of 1978
  42 U.S.C. 4901

## Health and Safety

- Occupational Safety and Health Act of 1970
  29 U.S.C. 651 et seq.
- Protection of Children from Environmental Health Risks and Safety Risks
  EO 13045
- Ammunition and Explosives Safety Standard
  AR 385-64
- Army Aviation Accident Prevention
  AR 385-95
- Army Safety Program
  AR 385-10
- Biological Defense Safety Program
  AR 385-69
- Chemical Weapons and Material Chemical Surety
  AR 50-6
- Disaster Relief
  AR 500-60
- Fire Protection
  AR 420-90
- Medical Logistics Policies and Procedures
  AR 40-61
- Army Chemical Agent Safety Program
  AR 385-61

## Materials and Wastes

- Atomic Energy Act of 1954
  42 U.S.C. 2011 et seq.
- Comprehensive Environmental Response, Compensation and Liability Act of 1980
  42 U.S.C. 9601 et seq.
- Other popular names associated with sections of the Comprehensive Environmental Response, Compensation and Liability Act

- Asset Conservation, Lender Liability, and Deposit Insurance Protection Act of 1996
- Community Environmental Response Facilitation Act
- Superfund Amendments and Reauthorization Act of 1986

♦ Emergency Planning and Community Right-to-Know Act of 1986
42 U.S.C. 11001 et seq.

♦ Federal Insecticide, Fungicide, and Rodenticide Act of 1947
Federal Insecticide, Fungicide, and Rodenticide Act Amendments of 1988
7 U.S.C. 136

♦ Hazardous Material Transportation Act of 1975
49 U.S.C. 5101 et seq.

♦ Low Level Radioactive Waste Policy Act of 1980
42 U.S.C 2021b-2021d

♦ Oil Pollution Act of 1990
33 U.S.C. 2701 et seq.

♦ Solid Waste Disposal Act of 1965
42 U.S.C. 3251 et seq.

♦ Other popular names associated with sections of the Solid Waste Disposal Act

- RCRA of 1976
- Federal Facility Compliance Act of 1992
- Solid Waste Disposal Act
- Hazardous and Solid Waste Amendments of 1984
- Land Disposal Flexibility Act of 1996
- Medical Waste Tracking Act of 1988
- Solid Waste Disposal Act Amendments of 1980
- Used Oil Recycling Act of 1980

♦ TSCA of 1976
15 U.S.C. 2601 et seq.

♦ Other popular names associated with sections of the TSCA
Lead-Based Paint Exposure Reduction Act
15 U.S.C. 2681

- Solid and Hazardous Waste Act
  Utah Code Annotated 19-6-101 – 123
- Hazardous Waste Site Facility Siting Act
  Utah Code Annotated 19-6-201 – 208
- Hazardous Substances Mitigation Act
  Utah Code Annotated 19-6-301 – 325
- Lead Acid Battery Disposal
  Utah Code Annotated 19-6-601 – 607
- Pesticide Control Act
  Utah Code Annotated 68-7
- Radiation Control Act
  Utah Code Annotated 19-3-101 – 317
- Solid Waste Management Act
  Utah Code Annotated 19-6-501 – 506
- Used Oil Management Act
  Utah Code Annotated 19-6-701 – 723
- Greening the Government Through Waste Prevention, Recycling, And Federal Acquisition
  EO 13101
- Biological Defense Safety Program
  AR 385-69
- Occupational Ionizing Radiation Personnel Dosimetry
  AR 40-14
- Handling, Storage, Use, and Disposal of PCBs
  AR 200-1-5-6
- Labeling and Transportation of Hazardous Materials
  AR 55-355
- Management of Controlled Substances, Ethyl Alcohol, and Hazardous Biological Substances in Army Research, Development, Test, and Evaluation Facilities
  AR 70-65
- Nuclear and Chemical Weapons and Material, Chemical Surety
  AR 50-6

- Pest Management Program
  AR 420-76
- Responsibilities and Procedures for Explosive Ordnance Disposal
  AR 75-15
- Safety Studies and Review of Agents and Associated Weapon Systems
  AR 385-61
- Solid and Hazardous Waste Management
  AR 420-47
- The Army Chemical Agent Safety Program
  AR 385-61

## Utilities and Support Infrastructure

- Architectural Barriers Act of 1968
  42 U.S.C. 4151 et seq.
- Acquisition of Real Property and Interests Therein
  AR 405-10
- Buildings and Structures
  AR 420-70
- Utility Services
  AR 420-49
- Master Planning for Army Installations
  AR 210-20
- Army Military Construction, Program Development and Execution
  AR 415-15
- Pest Management
  AR 420-76
- Responsibilities and Procedures for Explosive Ordnance Disposal
  AR 75-15
- Security of Unclassified Army Property (Sensitive and Nonsensitive)
  AR 190-51
- Solid and Hazardous Waste Management
  AR 420-47

- Toxic Chemical Agent Safety Standards
  AR 385-61
- U.S. Army Explosives Safety Program Regulation
  AR 385-64
- U.S. Army Physical Security Program
  AR 190-13

## A2.0 Permits and Licenses

This section lists permits and licenses that apply to DPG's operations.

- Animal and Plant Health Inspection Service/USDA Permit
  PPG526
  Plant/Pest application of *Erwinia herbicola*
- Approval Order for Combined Chemical Laboratory Facility
  State of Utah
  Department of Environmental Quality
  Division of Air Quality
  Approval Order Number DAQE-1177-92
- Approval Order for Life Science Test Facility
  State of Utah
  Department of Environmental Quality
  Division of Air Quality
  Approval Order Number DAQE-195-97
  March 14, 1997
- Approval Order for a Materiel Testing Facility (MTF)
  State of Utah
  Department of Environmental Quality
  Division of Air Quality
  Approval Order Number DAQE-130-00
  March 13, 2000
- Approval Order for Smoke and Obscurant Testing Program
  State of Utah
  Department of Environmental Health
  Bureau of Air Quality
  Approval Order Number BAQE-559-89
  August 8, 1989

- Notice of Intent for
  Open Burning, Open Detonation
  Dugway Proving Ground
  September 1, 1999

- Title V Operating Permit
  State of Utah
  Department of Environmental Quality
  Division of Air Quality
  Permit No. 4500 00 3001
  February 2001

- Central Hazardous Waste Storage Facility
  RCRA Part B Permit – Final
  March 1994

- Igloo G
  RCRA Interim Status and Permit Applications Submitted
  March 2000

- Open Burn/Open Detonation
  RCRA Part A Application
  March 1995

- Munitions Cryofracture Test Facility
  RCRA Research, Design, and Development Permit
  September 1997

- ACWA
  Treatability Study Approval
  August 1999

- English Village Wastewater Treatment Facility
  State of Utah
  Division of Water Quality
  Department of Environmental Quality
  Utah Water Quality Board
  Permit No. UGW450007
  January 7, 1999
  Expiration Date January 7, 2004

- Utah Solid and Hazardous Waste Control Board
  Solid Waste Permit
  English Village Landfill
  Class II Noncommercial Solid Waste Landfill
  Approval Number 9615
  September 1, 1998
- Certificate of Registration
  Utah Division of Wildlife Resources
  Registration number 4BAND3402
  Capture, Marking, and Disposal of Wildlife
- Master Band Permit
  U.S. Fish Wildlife Service
  Permit number 22710
  Banding, Marking, and Disposal of Federal Migratory Birds

## A3.0 Management Plans and Standing Operating Procedures

This section lists management plans and standing operating procedures that apply to DPG operations. These management plans are presented by the resource area analyzed in the EIS.

### General

- MTAMP
- ITAM Program

### Water Resources

- CGWMP
- DWSP Plans

### Air Resources

- Utah Smoke Management Plan
- Air Monitoring Plan for Chemical Agents at the Chemical Test Division
- Air Monitoring Plan for the Bushnell Materiel Test Facility
- Ozone-Depleting Substances Elimination Plan
- Operations Involving Asbestos
  DPGR 385-2

- Chemical Agent Safety Regulation
  DPGR 385-4
- Emergency Destruction of Unsafe Chemical Munitions Found on Test Ranges
  DPG SOP DP-0000-M-028
- Laboratory Toxic Agent Operations and Chemical Agent Safety at the Combined Chemical Test Facility
  DPG SOP DP-0000-M-070
- Munitions Demilitarization – Open Burning of Propellant, Propellant Charges, and Bulk Explosives
  DPG SOP DP-0000-H-138
- Munitions Demilitarization-Detonation, Open Detonation of Munitions and Explosives
  DPG SOP DP-0000-G-139
- Munitions Demilitarization for Smoke Producing Munitions
  DPG SOP DP-0000-S-199
- Operation of the Bushnell Materiel Test Facility
  DPG SOP DP-0000-M-101

## Biological Resources

- INRMP
- Pest Management Plan

## Land Use and Access

- Real Property Master Plan
- SDP
- Range and Training Area Regulation
  DPGR 350-2

## Cultural and Historic Resources

- ICRMP

## Noise

- ICUZ now called ENMP

## Health and Safety

- Biological Emergency Response and Assistance Program

- DCP
- Dugway Proving Ground Health and Safety Programs for Air Force Activities
- CAIRA Plan
- Employee Health Monitoring Program for the LSTF
- Accident Prevention Program
  DPGR 385-1
- Chemical Agent Safety Regulation
  DPGR 385-4
- Chemical Surety Program
  DPGR 50-1
- Fire Prevention and Protection Program
  DPGR 420-8
- Range and Training Area Regulation
  DPGR 350-2
- Test Coordination and Conduct
  DPGR 70-3
- Chemical Hygiene Plan for the Safe Storage, Handling, and Use of Hazardous Chemicals in the Life Sciences Division
  DPG SOP WD-L 332
- Control and Audit of Infectious Microorganisms and Toxins
  DPG SOP WD-L 327
- Emergency Destruction of Unsafe Chemical Munitions Found on Test Ranges
  DPG SOP DP-0000-M-028
- Emergency Evacuation Plan, Life Sciences Division
  DPG SOP WD-L 329
- Laboratory Safety Manual
  DPG SOP WD-L 326
- M6A1 Filter Operation at Toxic Chemical Agent Storage at Igloo G
  DPG SOP DP-0000-M-170
- Movement of Chemical Surety Material Outside the Exclusion Area
  DPG SOP DP-0000-L-027

- Munitions Demilitarization – Open Burning of Propellant, Propellant Charges, and Bulk Explosives
  DPG SOP DP-0000-H-138
- Munitions Demilitarization-Detonation, Open Detonation of Munitions and Explosives
  DPG SOP DP-0000-G-139
- Munitions Demilitarization for Smoke Producing Munitions
  DPG SOP DP-0000-S-199
- Operation of the Defensive Test Chamber
  DPG SOP DP-0000-L-27
- Safety Guide for Work with Toxins at the Life Sciences Test Facility
  DPG SOP WD-L 328
- Safety Guide for Working in the High Containment, Biosafety Level 3 (BL-3) Laboratories in the Life Sciences Test Facility
  DPG SOP WD-L 330
- Safe Use of Radioactive Substances for Biological Investigations
  DPG SOP WD-L 335
- Transportation, Handling, and Packaging of Ammunition and Ammunition Components
  DPG SOP DP-0000-L-650

## Materials and Wastes

- Asbestos Management Plan
- CAIRA Plan
- CAWMP
- HWMP
- Pest Management Plan
- Pollution Prevention Plan
- Quality Assurance Program Plans (QAPPs)
- Quality Control Plan for Safety Monitoring of Chemical Agent
- SPCCP/ISCP

- Accident Prevention Program
  DPGR 385-1
- Operations Involving Asbestos
  DPGR 385-2
- Inventory Management – Munitions Management and Control
  DPGR 710-3
- Chemical Agent Safety Regulation
  DPGR 385-4
- Range and Training Area Regulation
  DPGR 350-2
- Emergency Destruction of Unsafe Chemical Munitions Found on Test Ranges
  DPG SOP DP-000-M-028
- Hazardous Waste Storage Facility Igloo G: Inventory and Inspection of Range Recovered Munitions (RRM)
  DPG SOP DP-000-L-652
- Laboratory Toxic Agent Operations and Chemical Agent Safety at the Combined Chemical Test Facility
  DPG SOP DP-0000-M-70
- Magazine/Outdoor Storage Site Inspection
  DPG SOP DP-0000-R-301
- Movement of Chemical Surety Materials Between Limited Areas for Quantities Greater Than 40 Milliliters
  DPG SOP DP-0000-M-076
- Movement of Chemical Surety Materials Between Limited Areas for Quantities Less Than 40 Milliliters
  DPG SOP DP-0000-M-072
- Munitions Demilitarization – Open Burning of Propellant, Propellant Charges, and Bulk Explosives
  DPG SOP DP-0000-H-138
- Munitions Demilitarization-Detonation, Open Detonation of Munitions and Explosives
  DPG SOP DP-0000-G-139

- Munitions Demilitarization for Smoke Producing Munitions
  DPG SOP DP-0000-S-199
- Range Clearance Operations
  DPG SOP DP-0000-M-026
- Receipt, Storage, Inventory, and Issue of Chemical Surety Material and Munitions
  DPG SOP DP-0000-L-651
- Standing Operating Procedure/Operating Instruction for Hazardous and Solid Waste Generating, Reporting, Packaging, Disposal and Recycling
  DPG SOP OI-144-I
- PCB Handling Techniques and Procedures
  DPG SOP 6-005
- Safe Use of Radioactive Substances for Biological Investigations
  DPG SOP WD-L 335
- Storage Monitoring of Toxic Chemical Munition; Bulk Toxic Chemicals and Storage Structures
  DPG SOP DP-0000-W-305
- Transportation, Handling, and Packaging of all Ammunition and Components
  DPG SOP DP-0000-L-650

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FINAL ENVIRONMENTAL IMPACT STATEMENT FOR
ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT
U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX B*

*DPG Facility Control Forms*

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## DPG Facility Control Forms

Appendix B contains facility control forms that present the size, structure type, and engineering and administrative controls for DPG's primary facilities. This appendix provides facility forms for the following facilities:

- BangBox™
- Bushnell Materiel Test Facility
- Central Hazardous Waste Storage Facility
- Chemical Agent Test Chamber
- Cryofracture Test Facility
- Defensive Test Chamber
- Igloo G
- Lothar Salomon Life Sciences Test Facility
- Open Burn/Open Detonation
- Open Burn/Open Detonation, improved
- Reginald Kendall Combined Chemical Test Facility
- Suppressive Shield Facility

The facility control forms present engineering controls in the following format:

- Emission Controls - mitigation measures to prevent materials from being released to the environment including:
  - Air Filtration: treats exhaust waste streams
  - Vapor Filtration: treats gaseous waste streams
  - Negative Air Pressure: prevents air from flowing out of the test area by maintaining a lower pressure inside the test area than outside
  - Fume Hoods: contain operations inside a small area and continuously exhaust the area
  - Glove Boxes: contain operations within controlled working area with no direct contact between personnel and materials inside the box
  - Double Doors: contain operations within controlled working area inside the building

- Air Lock Rooms: maintain negative air pressure by providing air tight rooms to prevent release of materials

♦ Observation and Control Room

♦ Emergency Generators - operate essential functions, such as lights, environmental control systems, ventilation fans, etc., in the event of a power outage

♦ Test Clean-up Controls - procedures and equipment available to remove, destroy, or neutralize contamination from chemical- or biological-related wastes. Where decontamination is not an issue, general clean-up procedures may be described.

♦ Security Measures - measures to prevent unauthorized entry, such as fencing, guards, electronic key cards, and intrusion detection systems, etc.

The facility control forms present administrative controls in the following format:

♦ Record Keeping - creates documentation at the facility for tracking purposes

♦ Training - provides personnel with skills and knowledge on safety, and emergency procedures specific to facility where they work, including proper handling of materials, evacuation procedures, and safety drills

♦ Personal Protective Equipment - masks and clothing that provide personal protection from materials and will sustain life and allow for continued operation capability in environments that are potentially hazardous to human health

♦ Compliance with Safety-Related Regulations, Pamphlets, SOPs

General Location: Three miles west of Ditto, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: Two 1,000-$m^3$ (1,306 $yd^3$) hemispheres anchored to concrete pads

Structure Type: Polyvinyl chloride-coated polyester fabric. Steel plated 1-sq m (10.76 sq ft) burn pad used for open burn tests, steel plated open detonation pit, angle iron suppressive shield, plywood witness shield.

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: Primary blower systems
  - Vapor Filtration: NA
  - Positive Air Pressure: Primary and secondary blower systems maintain pressure differential of 1.9 cm of mercury (0.75 inches of mercury) in water column between test chamber and airlock.
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: Each structure has a 3 by 3 by 7 m (9.84 by 9.84 by 23 ft) airlock that adjoins the test chamber.
- Observation and Control Room - NA
- Emergency Generators - 115/220-volt commercial power with back up gasoline powered generator/blower motor
- Test Clean-up Controls - BangBox™ structures are decontaminated by wiping down the test chamber with water and vacuuming. Burn pad area within suppressive shield is swept and the collected material is sealed in appropriate sample containers that are sent off site for analysis.
  - Tanks: NA
  - Sumps: NA
  - Showers: NA
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - Data collection system tracks sampling data in the instrumentation control building. All data generated must be legally defensible and is used to support Federal and state required permits and reports.
- Training - SOP for Propellant, Explosive and Pyrotechnic Thermal Treatment Test Facility (PEP-TTET) (Bang Boxes™) DP-0000-P-851
- Personal Protective Equipment - Safety eye wear, face shields, leather gloves, steel toed shoes, and coveralls
- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOPs DP-0000-H-138, Munitions Demilitarization Open Burn of Propellant Charges, Bulk Explosives (HMX or RDX); DP-0000-G-139, Munitions Demilitarization-Detonation, Open Detonation of Munitions and Explosives; SOP DP-0000-1-651, Receipt, Storage, Inventory, and Issue of Chemical Surety Material; SOP DP-0000-P-851, Propellant, Explosive, and Pyrotechnics Thermal Treatment Test Facilities (PEP-TTET) (Bang Boxes™); AR 200-1, Environmental Protection and Enhancement; AR 200-2, Environmental Effects of Army Actions; AR 385-10, The Army Safety Program; AR 385-64, Safety: Ammunition and Explosive Safety Standard; AR 45-15, AR 420-47, Solid and Hazardous Waste Management; DOD Directive 4165.60; CAA-42 U.S.C. 7401; Endangered Species Act-16 U.S.C. 1536; FWPCA-33 U.S.C. 1251; NEPA-42 U.S.C. 4321; OSHA; RCRA; SDWA; TSCA; UDSHW Rules

Sources: DPG, 1996e

General Location: Carr Facility, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: Approximately 1,245 sq m (13,400 sq ft)

Structure Type: Structural steel building with concrete floors

Number of Levels: 3, with the second floor used exclusively for administrative support and staff.

Facility Engineering Controls:

- Emission Controls

  - Air Filtration: Six Air Handling Units (AHUs) are located in the mechanical equipment areas. Four of the AHUs supply conditioned air to the three test chambers and air lock areas. The three test chambers are equipped with high HEPA filters and carbon filter units. The filter units function as a mitigation measure to prevent materials from being released to the outside environment if an accidental reversal of the airflow through the AHUs occurs. The other two AHUs supply conditioned air to the nontest-related, administrative, and hall areas. The AHUs for these areas do not have carbon filter units.

  - Vapor Filtration: The Pollution Abatement System (PAS) has three subsystems designed to treat specific gaseous waste streams from the BMTF. However, the agent suppository system operates independently to exhaust air through its filtration system. During chemical agent defense testing, exhaust air from the test chambers or fixtures will be routed through the PAS to remove all of the chemical agent materials before it is released to the atmosphere. A description of the three PAS subsystems follows:

    - The Toxic Agent Filter Abatement System (TAFAS) removes chemical agentand chemical simulant materials from air exhausted from the three test chambers. The TAFAS contains a large-particle prefilter, HEPA filter, five banks of carbon filters, and a final HEPA filter. Air exhaust from the test chambers and engineered control air are heated to lower the relative humidity to below 70 percent, then directed through the TAFAS. The TAFAS is designed to handle a flow rate of 538 to 1,019 $m^3$/min (19,000 to 36,000 cubic feet ($ft^3$) per minute).

    - The agent repository filter system removes chemical agent materials from the effluent airstream from the agent repository. The agent suppository filter system consists of a single prefilter, two carbon filters, and a single HEPA filter.

  - The Thermal Pollution Abatement Device (TPAD) treats engine exhaust from test vehicles that are run during testing in the Multipurpose Test Chamber. The TPAD is a propane furnace and quench tower. It is used to prevent gaseous waste streams containing hot engine exhaust from damaging the TAFAS. It may also be used to lessen the impact and loading of nonagent challenge materials on the carbon filters in the TAFAS.

- Negative Air Pressure: The three test chambers are operated at negative air pressure during testing.

- Fume Hoods: Two fume hoods are located in the Agent Transfer Chamber.

- Glove Boxes: Glove boxes or small test fixtures can be used in the Closed System Chamber, Agent Transfer Chamber, and the Multipurpose Chamber.

- Double Doors: The three test chambers contain double doors.

- Air Lock Rooms: The three test chambers are designed to prevent the release of chemical agents into the outside environment during testing.

♦ Observation and Control Room - The observation and control room contains observation windows that overlook the three test chambers. There are computerized controls for all of the building and test chamber security systems, environmental controls and safety monitors, and test instrumentation, located in the designated testing areas. A programmable logic controller system is used to monitor approximately 1,500 sensors located throughout the building. These sensors are monitored at a rate of ten times per second and corrective actions are implemented based on decision algorithms built into the system. Building monitoring and control functions are controlled by redundant primary and back-up computer systems.

♦ Emergency Generators - Yes

♦ Test Clean-up Controls - The spent decontaminant solution neutralization system provides a back-up capacity for handling spent decontamination solutions. Spill and decontamination materials are placed in 208-L (55-gallon) drums when possible.

- Tanks:

  - Sodium hydroxide, 2,389 L (750 gallon), agitated
  - Sodium carbonate, 2,389 L (750 gallon), agitated
  - Sodium hypochlorite, 2,389 L (750 gallon), agitated

- Spent decontamination fluid can be stored in three 18,927-L (5,000-gallon) double-walled ASTs located west of the BMTF. The spent decontamination storage tanks are located on a concrete pad and are surrounded by a concrete containment berm.

- Sumps: Washwater from the three test chambers and the three first stage doffing shower areas drain into eight collection sumps divided between each of the three test chambers.

- Showers: Decontamination showers are available for egress procedures.

♦ Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

♦ Record Keeping - Specified in SOP DP-0000-M-101, Operation of the Bushnell Materiel Test Facility (BMTF)

♦ Training - Specified in SOP DP-0000-M-101, Operation of the Bushnell Materiel Test Facility (BMTF)

♦ Personal Protective Equipment - Specified in SOP DP-0000-M-101, Operation of the Bushnell Materiel Test Facility (BMTF)

♦ Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOP DP-0000-M-101, Operation of the Bushnell Materiel Test Facility (BMTF): Establishes uniform pretest checkout and operational procedures in conjunction with chemical agent defense testing at the BMTF. Requires an on-site medical aid station with a negative pressure toxic isolation cubicle is manned during testing. A medical doctor is on standby in English Village during chemical agent tests. UDAQ AO No. DAQE-816-98 must also be complied with.

Sources: DPG, 1999b; SIPRI, 1999

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General Location: Within 1.6 km (1 mi) of Five Mile Hill, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: 620 sq m (6,672 sq ft)

Structure Type: Metal

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: NA
  - Vapor Filtration: NA
  - Negative Air Pressure: NA
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: NA
- Observation and Control Room - NA
- Emergency Generators - NA
- Test Clean-up Controls
  - Tanks: One 1,893-L (500-gallon) tank is for the emergency shower only.
  - Sumps: The inside warehouse has 16-drum bay areas and there is one sump per bay as verified by the RCRA AO.
  - Showers: There is one emergency decontamination shower.
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - The CHWSF facility uses an electronic Hazardous Waste Tracking Database. Second hard copy folder files are kept with hazardous waste manifest folder files in the office work trailer.

- Training - Employee and worker training records are kept in the office work trailer while a second copy is kept by the DPG Environmental Training Director.

- Personal Protective Equipment - Level B, C, and D protection are all stored and maintained on-site.

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - CHWSF SOPs, Army regulations, state regulations, Part B RCRA Permit, and the following procedures:

  Standing Operating Procedures

  SOP HWSF-01, Facility Standing Operating Procedures; SOP HWSF-01A, Spill Prevention Control and Countermeasures Plan; SOP HWSF-02, Sampling Hazardous Waste/Material; SOP HWSF-03, Pick-up and Transportation of Hazardous Waste; SOP HWSF-04, Use and Care of Air Purifying Respirators; SOP HWSF-05, Facility Routine Back-up Procedures; SOP HWSF-06, Decontamination Program; SOP HWSF-07 Medical Surveillance; SOP HWSF-08, Health and Safety; SOP HWSF-09, Hazardous Communication; SOP HWSF-10, Material Handling Program; SOP HWSF-11, Solid Waste Management Unit; SOP HWSF-12, Container Management Program; SOP HWSF-13, Orphan Program; SOP HWSF-14, HWTS Operations; SOP HWSF-15, Database Management; SOP HWSF-16, 90-Day Accumulation Site Inspections; SOP HWSF-17, Manifesting and Reporting; SOP HWSF-18, Management of 90-Day Accumulation Sites; SOP HWSF-19, Management of RFI and IRP Waste; SOP HWSF-20, Lab Packing Operations

  Administrative Procedures

  AP HWSF-01, Fire Prevention; AP HWSF-02, Employee Emergency Plan; AP HWSF-03, New Technologies Program; AP HWSF-04, Personnel Training; AP HWSF-05 Facility Orientation; AP HWSF-06, Preparedness and Prevention

Sources: UDSHW, 1998a

General Location: Carr Facility, shown on Figure 2.1-3, DPG Activity Centers and Facilities
Footprint Area: Approximately 622.5 sq m (6,700 sq ft)

Structure Type: Steel structural members and concrete walls

Number of Levels: 1 level control center elevated from the floor of the facility

Facility Engineering Controls:

- Emission Controls
  - Vapor and Air Filtration: Test air from the two test chambers is passed through redundant HEPA and charcoal filters prior to atmospheric discharge.
  - Negative Air Pressure: Test chambers are operated under negative pressure during tests. Gloves boxes are also operated under negative pressure during tests.
  - Fume Hoods: NA
  - Glove Boxes: Many tests are conducted within subchambers or glove boxes. The glove boxes range in size from approximately 0.92 by 1.9 by 0.92 m (3 by 6 by 3 ft) to 2.4 by 2.4 by 2.4 m (8 by 8 by 8 ft) but may also be larger.
  - Double Doors: 2 double doors, 1 set each chamber
  - Air Lock Rooms: The test chambers are completely sealed during tests.
- Observation and Control Room - Test chamber personnel can view operations within both test chambers through a window in an elevated observation room. The observation room is sealed off from the test chambers.
- Emergency Generators - Yes
- Test Clean-up Controls
  - Tanks: Closed off tanks removed
  - Sumps: Closed off plate welded over drains
  - Showers: An eye wash and a decontamination shower are available.

- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - Specified in SOP DP-0000-S-106, Emergency and Decon Procedures for the Chemical Agent Test Chamber

- Training - Specified in SOP DP-0000-S-106, Emergency and Decon Procedures for the Chemical Agent Test Chamber

- Personal Protective Equipment - Specified in SOP DP-0000-S-106, Emergency and Decon Procedures for the Chemical Agent Test Chamber

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOP DP-0000-S-106, Emergency and Decon Procedures for the Chemical Agent Test Chamber, establishes uniform pre-test checkout and operational procedures in conjunction with chemical agent defense testing at the Chemical Agent Test Chamber.

Sources: AGEISS, 1999a; Andrulis, 1992; DPG, 1997d; Wheeler and Wheeler, 1997a

General Location: Eastern flank of Granite Peak, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: The building which houses the hydraulic press, robot, and cryobath covers a 232.3 sq m (2,500 sq ft) area. The open-grate furnace and a 22,712-L (6,000-gallon) liquid nitrogen tank are located outside of the building.

Structure Type: Metal building

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: NA
  - Vapor Filtration: NA
  - Negative Air Pressure: NA
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: NA

- Observation and Control Room - Operational control and data acquisition are performed by a supervisory computer located in a 12.2-m (40-ft) trailer. The supervisory computer controls and monitors the process (cryobath, robot, press, fragment cart, and furnace), collects the required data, and monitors a variety of alarms. The control center trailer is located behind an earthen berm approximately 183 m (600 ft) from the test facility. Six closed-circuit television cameras are installed at key positions in the facility to provide test personnel with visual confirmation that the critical steps in the test operations are performed successfully. The closed-circuit television monitors are located in the control center trailer.

- Emergency Generators - Generators are used to power the facility and the control center trailer. An emergency generator is not available. Electrical power for the facility is provided by a 200-kW diesel generator and for the control center by an 80-kW diesel generator.

- Test Clean-up Controls
  - Tanks: A portable 2,271-L (600-gallon) tank is used to provide water for equipment clean-up, personnel wash-up, fire protection, and decontamination requirements, such as emergency shower and eyewash stations.
  - Sumps: NA

- Showers: emergency shower and eyewash stations

♦ Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

♦ Record Keeping - Specified in SOP DP-0000-P-853, Operation Cryofracture Demilitarization of Explosive and Pyrotechnic Munitions

♦ Training - Provides proper handling of munitions

♦ Personal Protective Equipment - Specified in SOP DP-0000-P-853, Operation Cryofracture Demilitarization of Explosive and Pyrotechnic Munitions, including leather gloves, steel-toed safety shoes, respirators, overalls, and shoe covers

♦ Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOP DP-0000-P-853, Operation Cryofracture Demilitarization of Explosive and Pyrotechnic Munitions, describes procedures for the operation of the Cryofracture Test Facility. All explosively configured munitions handling operations relative to moving the munitions into or out of the cryobath, the press, or the furnace, will be performed remotely. A robot will be used to load munitions into the cryobath, remove munitions from the cryobath, and place the munitions in the press; Munitions Cyrofracture Facility, RCRA Research, Design, and Development Plan September, 1997

Sources: GA, 1996b; GA, 1998; Wheeler et al., 1995

General Location: Southwest of the Carr Facility, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: Test Chamber is 9.1 by 15.2 by 9.1 m (30 by 50 by 30 ft).

Structure Type: Stainless steel

Number of Levels: Unknown

Facility Engineering Controls:

- Emission Controls
  - Vapor and Air Filtration: Prefilters, HEPA filters, and charcoal filters
  - Negative Air Pressure: The DTC is maintained under negative pressure relative to the outside air pressure during testing (approximately 0.7 inches of water gauge)
  - Fume Hoods: Chemical fume hood
  - Glove Boxes: There is a set of gloves in the window of the chamber.
  - Double Doors: Single large door on south end to close off chamber and it seals and secures building.
  - Air Lock Rooms: Doors are pneumatic and/or pressure cascade.
- Observation and Control Room - A control room within the DTC allows direct and video visual observation of, and voice communication with, persons working in the chamber
- Emergency Generators - back-up power generator
- Test Clean-up Controls
  - Tanks: Removed
  - Sumps: Sealed, welded shut
  - Showers: A decontamination shower is available for egress procedures.
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - Specified in SOP DP-0000-S-121, Operation of the Defensive Test Chamber
- Training - SOP DP-0000-S-121, Building Operations

- Personal Protective Equipment - Specified in SOP DP-0000-S-121, Operation of the Defensive Test Chamber, including steel-toed safety shoes, TAP clothing, and masks

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOP DP-0000-S-121, Operation of the Defensive Test Chamber, establishes uniform pretest checkout and operational procedures in conjunction with testing at the DTC. AR 50-6, Chemical Surety; AR 190-59, Chemical Agent Security Program; AMC 385-61

Sources: Andrulis, 1992; DPG, 2000i

General Location: Carr Facility, shown on Figure 2.1-3, DPG Activity Centers and Facilities
Footprint Area: 193.2 sq m (2,080 sq ft)

Structure Type: Earth covered igloo

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: Only if a leak inside the igloo is detected.
  - Vapor Filtration: Only if a leak inside the igloo is detected.
  - Negative Air Pressure: NA
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: NA
- Observation and Control Room - NA
- Emergency Generators - Emergency generators are used as back-up power for the Site Security Control Center, Change House, and intrusion detection system (IDS).
- Test Clean-up Controls
  - Tanks: NA
  - Sumps: NA
  - Showers: Shower is located in the Change House.
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - The Administration General Purpose Building in Carr contains records of current and past inventory, and inspections.
- Training - The Administration General Purpose Building in Carr contains facility manager training records, including OSHA, RCRA, and site-specific training.

- Personal Protective Equipment - TAP clothing

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOP-0000-L-652, Hazardous Waste Storage Facility, Igloo G; SOP-0000-M-078, Sampling at Igloo G; Part B RCRA Permit Training, Army regulations

Sources: UDSHW, 2000

General Location: Baker Area, shown on Figure 2.1-3, DPG Activity Centers and Facilities
Footprint Area: 2,972 sq m (32,000 sq ft)

Structure Type: Brick, metal, and structural concrete building

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: HEPA filters for the air vents, waste drain air vents and vacuum line
  - Vapor Filtration: HEPA filters
  - Negative Air Pressure: Air flows through the laboratory and is filtered.
  - Fume Control Hoods: One class II type A biosafety cabinet has an air flow directly into laboratory and mixes with make-up air and by differential air flow returns into the laboratory and is removed through the conventional ventilation system. The class II type B-1 and B-2 biosafety cabinets have dedicated ventilation hoods that directly vent exhaust air outside the laboratory building.
  - Glove Boxes: There are three class III biosafety cabinets. One is a half suit stationary aerosol cabinet. The second one is a portable wheeled biosafety cabinet and the third is a portable modular biosafety cabinet.
  - Double Doors: Self-closing double doors are used to enter BL 3 area.
  - Air Lock Rooms: Between laboratory rooms the doors are connected by small ventilated corridors that remove exhaust air by negative pressure. These zones connect the BL 2 area into the BL 3 area.
- Observation and Control Room - NA
- Emergency Generators - Yes
- Test Clean-up Controls - Decontamination procedures include the use of chlorine bleach, gaseous formaldehyde, and vaporous hydrogen peroxide. Eight autoclaves are also in use to sterilize laboratory equipment.
  - Tanks: NA
  - Sumps: NA
  - Showers: Numerous emergency showers and eyewash sinks are located throughout the LSTF.
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - Records of accidents, investigation reports, inspection reports, and inventory and usage of etiological substances are maintained.

- Training - Personnel are trained to properly handle and use hazardous chemicals or biological agents. Evacuation procedures and safety drills are included in training.

- Personal Protective Equipment - Masks and clothing required.

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - AR 385-10, Army Safety Program; AR 385-40, Accident Reporting and Records; AR 385-69, Army Biological Defense Safety Program; WD-L SOP No. 326, Laboratory Safety Manual; WD-L SOP No. 327, Control and Audit of Infectious Microorganisms and Toxins; WD-L SOP No. 328, Safety Guide for Work with Toxins at LSTF; WD-L SOP No. 329, Emergency Evacuation Plan, Life Sciences Division; WD-L SOP No. 330, Safety Guide for Working in the High Contaminant, BL 3 Laboratories in Building 2028; WD-L SOP No. 332, Chemical Hygiene Plan for the Safe Storage, Handling and Use of Hazardous Chemicals in LSTF; WD-L SOP No. 335, Safe Use of Radioactive Substances for Biological Investigation

Sources: DPG, 1995b; DPG, 1995c; DPG, 1995d; DPG, 1998b

General Location: Southeast portion of DPG, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: Approximately 0.22 sq km (53.76 acre)

Structure Type: Land cleared of vegetation

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: NA
  - Vapor Filtration: NA
  - Negative Air Pressure: NA
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: NA
- Observation and Control Room - NA
- Emergency Generators - NA
- Test Clean-up Controls
  - Tanks: NA
  - Sumps: NA
  - Showers: NA
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - A database contains a record of all detonations and burns.
- Training - Training records are maintained with West Desert Center Training Coordinator.

- Personal Protective Equipment - Equipment is located and maintained at the office in Carr Facility.

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - OB/OD regulations, Army regulations, OB/OD Permit

Sources: AGEISS, 1996b; DPG, 1999d

General Location: Near Granite Peak on Downwind South between Romeo and Tango roads, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: Diameter is 3.7 m (12 ft)

Structure Type: Two piece steel cylinder structure constructed of 1-inch steel plate that is bolted together

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air Filtration: NA
  - Vapor Filtration: NA
  - Negative Air Pressure: NA
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: NA
- Emergency Generators - Generator provides power for critical ODOBi operations in the event of a commercial power loss or interruption.
- Observation and Control Room - ODOBi includes a command post, which oversees all actions at the test site; an instrumentation bunker, which houses all instruments required to monitor actions inside ODOBi; a visitor center, and a data acquisition system. The ODOBi site is monitored by a video camera throughout testing.
- Test Clean-up Controls
  - Tanks: NA
  - Sumps: NA
  - Showers: NA
- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - DP-0000-P852, ODOBi, All Types of Munitions

- Training SOP - DP-0000-P852, ODOBi, All Types of Munitions

- Personal Protective Equipment - Specified in SOP No. DP-0000-P-852, ODOBi, all types of munitions.

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - The following SOPs are test-specific and provide a detailed outline of procedures for sampling, sampling equipment, sample handling, test procedures, quality assurance/quality control, and set up: SOP No. DP-0000-P-852, ODOBi, All Types of Munitions; SOP No. DP-0000-H-138, Open Burning of Propellant, Propellant Charges, and Bulk Explosives; SOP No. DP-0000-G-139, Explosive Test and Routine Demolition Procedure; SOP No. DP-0000-L-650, Transportation, Handling, and Packaging of Ammunition and Components; Army PAM 385-64, Ammunition and Explosives Safety Program. Letters of Instruction and Test Plans are also followed.

Sources: DPG, 1997f

General Location: Ditto Technical Center, shown on Figure 2.1-3, DPG Activity Centers and Facilities
Footprint Area: 3,252 sq m (35,000 sq ft)

Structure Type: The new laboratory building is structural concrete and cinder block and the old laboratory is cinder block on concrete slab at grade.

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Vapor and Air Filtration: The exhaust system, with redundant fans, controls and alarms, provides airflow for fume hoods. The exhaust air from all laboratory areas (not only fume hoods) is charcoal filtered before it is returned to the atmosphere. All air from the fume hoods is discharged through HEPA filters and redundant charcoal filters. The CCTF uses 13 charcoal-filter banks, each made of up of a five-stage system.
  - Negative Air Pressure: The building's pressurization system keeps laboratory rooms at a more negative air pressure than corridors, which in turn are kept more negative than the offices.
  - Fume Hoods:
    - Fume hoods are used for all chemical agent operations.
    - Seventeen fume hoods are located in the old chemical test laboratory building.
    - Fifty-two fume hoods are located in the new chemical test laboratory building; 32 fume hoods have been certified for agent use.
    - Epoxy and stainless steel work surfaces and interior finishes are resistant to chemical agents.
  - Glove Boxes: NA
  - Double Doors: Separate the administrative area from the chemical laboratory
  - Air Lock Rooms: NA
- Observation and Control Room - NA
- Emergency Generators - The CCTF has a 1-megawatt emergency generator. The generator supports the fume hoods, ventilation system, egress lighting, and other essential equipment in the event of a power loss.

- Test Clean-up Controls

  - Tanks: Contaminated water from any chemical agent spill clean-up or from emergency shower use is contained by a double-wall drain system and a 18,927-L (5,000-gallon) holding tank.
  - Sumps: NA
  - Showers: Emergency showers and eyewashes are provided in the laboratories and corridors.

- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping - Specified in SOP DP-0000-M-70, Laboratory Toxic Agent Operations and Safety

- Training - Health and safety first aid training requirements are specified in SOP DP-0000-M-70, Laboratory Toxic Agent Operations and Safety. Hazard communication training program assures employees are adequately informed about hazards of chemicals they work with, safety practices which reduce their risk of accidents, and occupational illness, and how to respond in the event of an emergency.

- Personal Protective Equipment - Specified in SOP DP-0000-M-70, Laboratory Toxic Agent Operations and Safety

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures - SOP DP-0000-M-70, Laboratory Toxic Agent Operations and Safety Chemical Hygiene Plan, lists general procedures; steps to be followed; and appropriate safety equipment to be used when working with chemical agent, solutions for research, development, test, and evaluation, and military agents within the CCTF. The Combined Chemical Test Facility Chemical Hygiene Plan specifies policies, practices, and procedures to protect employees from the hazards of chemicals used in the workplace.

Sources: Brimhall and Lemire, 1999; Dement, 1996; DPG, 2000g

General Location: North of Camels Back Ridge, shown on Figure 2.1-3, DPG Activity Centers and Facilities

Footprint Area: The outer building covers a 557.4 sq m (6,000 sq ft) area.

Structure Type: Sheet metal outer building for weather protection, with specially-sealed steel inner building and a blast chamber

Number of Levels: 1

Facility Engineering Controls:

- Emission Controls
  - Air and Vapor Filtration: If a chemical agent is detected inside Igloo 6, a mechanical vapor filter system is immediately attached to the roof vent and operated to reduce harmful vapors according to the Final Igloo 6 Modification to the Hazardous Waste Permit U. S. Army Dugway Proving Ground, UT Appendix J Igloo 6 Air Monitoring Plan Executive Secretary of the Utah Solid and Hazardous Waste Control Board through the Division of Solid and Hazardous Waste
  - Negative Air Pressure: NA
  - Fume Hoods: NA
  - Glove Boxes: NA
  - Double Doors: NA
  - Air Lock Rooms: NA

- Emergency Generators - An uninterruptable power supply provides power for critical suppressive shield operations in the event of a commercial power loss or interruption.

- Observation and Control Room - A control center is located 91.4 m (300 ft) from the facility. Video cameras are placed throughout the facility and in the blast chamber for viewing during tests.

- Test Clean-up Controls
  - Tanks: 3,785.4-L (1,000-gallon) water tank
  - Sumps: NA
  - Showers: An eye wash and a metal container filled with water large enough to submerge an individual are available.

- Security Measures – Appropriate security measures are in place per AR 190-13, Physical Security and AR 530-1, Operations Security.

Facility Administrative Controls:

- Record Keeping: Specified in SOP No. DP-0000-P-854, Suppressive Shield, All Types of Munitions, including checklists and a log of all discrepancies

- Training: Specified in SOP No. DP-0000-P-854, Suppressive Shield, All Types of Munitions, including certification for handling munitions

- Personal Protective Equipment: Specified in SOP No. DP-0000-P-854, Suppressive Shield, All Types of Munitions, including steel-toed safety shoes, leather gloves, coveralls, goggles, and faceshields

- Compliance with Safety-Related Regulations, Pamphlets, Standing and Internal Operating Procedures: SOP No. DP-0000-P-854, Suppressive Shield, All Types of Munitions. In addition, letters of instruction and test plans are followed. These are test-specific and provide a detailed outline of procedures for sampling, sampling equipment, sample handling, test procedures, quality assurance/quality control, and set up.

Sources: Vogel, 1998

# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX C*

*Mission Materials*

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# Mission Materials

Appendix C contains summary information about the mission materials used at DPG. Mission materials are materials that are the focus of or used in support of DPG's mission tests. This appendix does not contain information about all materials that could potentially be used at DPG in the future. New materials could be required for testing purposes in the future as a result of new national security concerns; the identification of new chemical agents or biological agents; or the identification of new biological or chemical simulants or smokes and obscurants that are effective for testing purposes. The use of any new material at DPG must undergo an environmental review process. Section 2.1.4.2, Primary Indoor Facilities, and Section 2.1.4.3, Primary Outdoor Facilities, discuss the facilities where mission materials are used at DPG.

Mission materials used at DPG that are summarized in this appendix include:

- Biological agents
- Chemical agents
- Chemical agent decontaminants
- Biological or chemical simulants
- Smokes and obscurants

Due to the wide variety of munitions and energetics used at DPG, a detailed list of these materials is not provided in this appendix. For a general summary of the types of munitions and energetics used at DPG, see Section 3.13.3.6, Munitions and Energetics.

Toxicity information regarding biological agents and simulants, chemical agents and simulants, chemical agent decontaminants, smokes and obscurants, and munitions and energetics are discussed in Appendix D, Toxicity Information About Mission Materials.

## C1.0 Biological Agents

At DPG biological agents are used only at the LSTF. The following biological agents were used at DPG from 1996 through 1998 (DPG, 1996f; DPG, 1997g; DPG, 1998c).

- Adenovirus
- *Aspergillus niger*
- *Bacillus anthracis*

- *Bacillus megatherium*
- *Bacillus thuringiensis (BT)*
- *Brucella melitensis*
- *Brucella suis*
- *Burkholderia mallei*
- *Burkholderia pseudomallei*
- *Clostridium botulinum toxin A*
- *Clostridium botulinum toxin B*
- *Coxiella burnetii (CB)*
- *Enterobacter agglomerans*
- *Escherichia coli*
- *Francisella tularensis*
- Influenza A
- *Mycobacterium tuberculosis*
- *Pseudomonas aeruginosa*
- Ricin toxin
- Staphylococcal enterotoxin B (SEB)
- *Staphylococcus aureus*
- T-2 toxin
- Vaccinia virus
- VEE
- *Vibrio cholerae*
- Yellow fever 17-D
- *Yersinia enterocolitica*
- *Yersinia pestis* (Plague)
- *Yersinia pseudotuberculosis*

## C2.0 Chemical Agents

The DOD defines a chemical agent as a chemical substance which is intended for use in military operations to kill, seriously injure, or incapacitate people because of its physiological effects. Excluded from this definition are riot control agents, herbicides, smoke, and flame retardants (Army, 1996a).

Chemical agents are used at the BMTF, CCTF, and the Chemical Agent Test Chamber. Table C-1, Chemical Agents, lists chemical agents used at DPG for chemical defense testing activities.

**Table C-1. Chemical Agents.**

| Name | Abbreviation |
|---|---|
| Arsine | SA |
| Bis(2-(2-chloroethylthio)) ethyl ether | T |
| Bis(2-chloroethyl) ethylamine (or Nitrogen Mustard, Type 1) | HN1 |
| Bis(2-chloroethyl) sulfide (or Distilled Mustard) | HD |
| Bis(2-chloroethyl) sulfide with 30 percent sulfur-based impurities (or Levinstein Mustard) | H |
| Bis(2-chloroethylthio)ethyl ether mixture (mixture of T and HD) | HT |
| Carbon dichloride oxide (or Phosgene) | CG |
| Cyanogen chloride | CK |
| Cyclohexyl methylphosphonofluoridate (or Cyclosarin) | GF (EA 1212) |
| Dichloro (2-chlorovinyl) arsine | Lewisite |
| Ethyl N,N-dimethylphosphoroamidocyanidate (or Tabun) | GA |
| Hydrogen cyanide | AC |
| Isopropyl methylphosphonofluoridate (or Sarin) | GB |
| Mustard/Lewisite mixture | HL |
| O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate | VX |
| O-ethyl S-(2-dimethylaminoethyl) methylphosphonothioate | Vx (EA 1699) |
| Pinacolyl methylphosphonofluoridate (or Soman) | GD |
| Thickened Soman | TGD |
| Thickened mustard | THD |
| Tris(2-chloroethyl) amine (or Nitrogen Mustard, Type 3) | HN3 |

SOURCES: AGEISS, 1999a; Brimhall and Lemire, 1999; Shipley et al., 1998

## C3.0 Chemical Agent Decontaminants

Chemical agent decontaminants are used for chemical defense testing activities in the BMTF, CCTF, and the Chemical Agent Test Chamber. Chemical agent decontaminants may be used elsewhere at DPG as part of management operations. For example, if there is a spill during transfer operations in a chemical agent storage facility, chemical agent decontaminants may be used. Table C-2, Chemical Agent Decontaminants, lists chemical agent decontaminants used at DPG.

**Table C-2. Chemical Agent Decontaminants.**

| Name | Abbreviation |
|---|---|
| Ammonia | $NH_4OH$ |
| Calcium hypochlorite or high test hypochlorite | HTH |
| Sodium carbonate | $Na_2CO_3$ |
| Sodium hydroxide | NaOH |
| Sodium hypochlorite or household bleach | NaOCl |
| Supertropical bleach | STB |

SOURCES: AGEISS, 1999a; AGEISS and AQS, 1998a

## C4.0 Biological and Chemical Simulants

Simulants are primarily used at the BMTF, LSTF, CCTF, DTC, Chemical Agent Test Chamber, and outdoors at various grids. Table C-3, Biological and Chemical Simulants, lists simulants that are currently used at DPG

**Table C-3. Biological and Chemical Simulants**

| Name (Abbreviation) | Types of Testing Activities |
|---|---|
| Acetic acid | Chemical Defense |
| *Bacillus subtilis; Bacillus subtilis* var. *niger* (BG) | Biological Defense |
| Bovine serum albumin | Biological Defense |
| Butane | Modeling and Assessment |
| Diethyl malonate (DEM) | Chemical Defense |
| *Erwinia herbicola* (EH) | Biological Defense |
| Fluorescent particles (FP) | Chemical Defense |
| Kaolin dust (Kaolin) | Biological Defense |
| Methyl salicylate (MeS) | Chemical Defense |
| Bacteriophage MS2 (MS2) | Biological Defense |
| Ovalbumin (OVA) | Biological Defense |
| Propane | Modeling and Assessment |
| Propylene | Biological Defense<br>Chemical Defense<br>Modeling and Assessment |
| Sulfur hexafluoride ($SF_6$) | Chemical Defense<br>Modeling and Assessment |
| Triethyl phosphate (TEP) | Chemical Defense |

SOURCES: DPG, 1996f; DPG, 1997g; DPG, 1998c

## C5.0 Smokes and Obscurants

Smokes and obscurants are primarily used at DPG outdoors at various grids. A small amount of smokes and obscurants may be used indoors as interferents to support other testing activities in facilities such as the BMTF, CCTF, and LSTF. Table C-4, Smokes and Obscurants, lists the smokes, obscurants, and interferents used at DPG.

**Table C-4. Smokes and Obscurants.**

| Name (Abbreviation) | Type | Primary Locations Used |
|---|---|---|
| Acetylene | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Alkyd Deck Enamel, Non-Skid | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Aluminum (Al) | • Smoke<br>• Obscurant | Outdoors |
| Aluminum coated glass | • Smoke<br>• Obscurant | Outdoors |

**Table C-4. Smokes and Obscurants.**

| Name (Abbreviation) | Type | Primary Locations Used |
|---|---|---|
| Aluminum isopropoxide | • Smoke<br>• Obscurant | Outdoors |
| Aluminum silicate, hydrated | • Smoke<br>• Obscurant | Outdoors |
| Ammonia, household | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Ammonium chloride | • Smoke<br>• Obscurant | Outdoors |
| Amorphous silica | • Smoke<br>• Obscurant | Outdoors |
| Anthracene | • Smoke<br>• Obscurant | Outdoors |
| Aqueous Film Forming Foam, 100% (AFF) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| *Bacillus subtilis* (BG) | Interferent | • CCTF<br>• LSTF |
| Berger mixtures | • Smoke<br>• Obscurant | Outdoors |
| Brake fluid | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Brass | • Smoke<br>• Obscurant | Outdoors |
| Calcium hypochlorite or high test hypochlorite (HTH) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Carbon fibers | • Smoke<br>• Obscurant | • CCTF<br>• LSTF<br>• Outdoors |
| Cardboard, burning | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Chlorosulfonic acid | • Smoke<br>• Obscurant | Outdoors |
| Cigarette smoke | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Cigarette smoke, exhaled | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Cleaner, general purpose | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Cloth, burning cotton | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Colored smokes | • Smoke<br>• Obscurant | • CCTF<br>• LSTF<br>• Outdoors |
| Crude oil | Interferent | • CCTF<br>• LSTF |

**Table C-4. Smokes and Obscurants.**

| Name (Abbreviation) | Type | Primary Locations Used |
|---|---|---|
| Deck paint | Interferent | BMTF |
| Decontaminating Solution No. 2 (DS2) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| De-icing fluid | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Diatomaceous earth | • Smoke<br>• Obscurant | Outdoors |
| Diesel exhaust and vapor | • Smoke<br>• Obscurant<br>• Interferent | • BMTF<br>• CCTF<br>• LSTF<br>• Outdoors |
| Doused fire, pine | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Dust, explosive | • Smoke<br>• Obscurant | Outdoors |
| Dust, vehicular | • Smoke<br>• Obscurant | Outdoors |
| Ethanol | Interferent | • CCTF<br>• LSTF |
| Fires, oil and debris | • Smoke<br>• Obscurant | Outdoors |
| Fly ash | • Smoke<br>• Obscurant | Outdoors |
| Fog oil | • Smoke<br>• Obscurant<br>• Interferent | • CCTF<br>• LSTF<br>• Outdoors |
| Freon | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Fuming sulfuric acid | • Smoke<br>• Obscurant | Outdoors |
| Gasoline exhaust and vapor | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Glass fibers, metalized | • Smoke<br>• Obscurant | • CCTF<br>• LSTF<br>• Outdoors |
| Graphite | • Smoke<br>• Obscurant<br>• Interferent | • CCTF<br>• LSTF<br>• Outdoors |
| Green Bush Burning (Artemesia sp.) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Green smoke<br>(7H-benz(de)anthracen-7-one) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Ground limestone | • Smoke<br>• Obscurant | Outdoors |

**Table C-4. Smokes and Obscurants.**

| Name (Abbreviation) | Type | Primary Locations Used |
|---|---|---|
| Halon | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Heating oil | • Smoke<br>• Obscurant | Outdoors |
| Hexachlorobenzene | • Smoke<br>• Obscurant | Outdoors |
| Hexachloroethane (HC) | • Smoke<br>• Obscurant | • CCTF<br>• LSTF<br>• Outdoors |
| Hydrochloric Acid | Interferent | • CCTF<br>• LSTF |
| Insect Repellant (DEET) | Interferent | • CCTF<br>• LSTF |
| Iron (Fe) | • Smoke<br>• Obscurant | Outdoors |
| Iron (Ironpentacarbonyl (IPC)) | • Smoke<br>• Obscurant | Outdoors |
| Iron coated glass | • Smoke<br>• Obscurant | Outdoors |
| Iron oxide (FeO) | • Smoke<br>• Obscurant | Outdoors |
| Isopropanol | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| JP-4, JP-5, JP-8 exhaust and vapor | • Smoke<br>• Obscurant<br>• Interferent | • BMTF<br>• CCTF<br>• LSTF<br>• Outdoors |
| Kaolin | • Smoke<br>• Obscurant<br>• Interferent | • BMTF<br>• CCTF<br>• LSTF<br>• Outdoors |
| Kerosene | • Smoke<br>• Obscurant<br>• Interferent | • BMTF<br>• CCTF<br>• LSTF<br>• Outdoors |
| M256 Chemical Agent Detector Kit | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| M56 Fog oil with graphite | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| M76 Smoke (brass powder) | • Smoke<br>• Obscurant<br>• Interferent | • BMTF<br>• CCTF<br>• LSTF<br>• Outdoors |
| M8+ smoke | Interferent | • BMTF<br>• CCTF<br>• LSTF |

**Table C-4. Smokes and Obscurants.**

| Name (Abbreviation) | Type | Primary Locations Used |
|---|---|---|
| Methanol | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Methyl salicylate (MeS) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Motor oil | Interferent | • CCTF<br>• LSTF |
| Napthalene | • Smoke<br>• Obscurant | Outdoors |
| Nickel coated glass | • Smoke<br>• Obscurant | Outdoors |
| Ovalbumin (OVA) | Interferent | • CCTF<br>• LSTF |
| Phosphorus | • Smoke<br>• Obscurant | Outdoors |
| Pine oil cleaner | Interferent | • CCTF<br>• LSTF |
| Plastic, burning (PVC) | Interferent | • CCTF<br>• LSTF |
| Polyethylene glycol (PEG) | • Smoke<br>• Obscurant<br>• Interferent | • CCTF<br>• LSTF<br>• Outdoors |
| Portland cement | • Smoke<br>• Obscurant | Outdoors |
| Power steering fluid | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Radiator coolant, ethylene glycol | Interferent | BMTF |
| Red phosphorus (RP) | Interferent | • CCTF<br>• LSTF<br>• Outdoors |
| Red smoke (1-methylaminoanthraquinone) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| SF-96 | Interferent | BMTF |
| SF-99 | Interferent | BMTF |
| Silicon chlorides | • Smoke<br>• Obscurant | Outdoors |
| Sodium hypochlorite (NaOCl) or household bleach | Interferent | • CCTF<br>• LSTF |
| Sulfur trioxide | • Smoke<br>• Obscurant | Outdoors |
| Sulfuric acid, fuming | • Smoke<br>• Obscurant | Outdoors |
| Supertropical bleach (STB) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Terephthalic acid | • Smoke<br>• Obscurant | • CCTF<br>• LSTF<br>• Outdoors |

**Table C-4. Smokes and Obscurants.**

| Name (Abbreviation) | Type | Primary Locations Used |
|---|---|---|
| Terephthalic acid smoke | Interferent | • CCTF<br>• LSTF |
| Tetrachlorides | • Smoke<br>• Obscurant | Outdoors |
| Tire, burning | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Titanium chlorides | • Smoke<br>• Obscurant | Outdoors |
| Titanium dioxide ($TiO_2$) | • Smoke<br>• Obscurant | • CCTF<br>• LSTF<br>• Outdoors |
| Titanium (IV) ethoxide | • Smoke<br>• Obscurant | Outdoors |
| Titanium (IV) isopropoxide | • Smoke<br>• Obscurant | Outdoors |
| Transmission fluid | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| Violet smoke<br>(1,4-di-p-toluidino-anthraquinone) | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| White phosphorus (WP) | • Smoke<br>• Obscurant<br>• Interferent | • BMTF<br>• CCTF<br>• LSTF<br>• Outdoors |
| Wood, burning pine | Interferent | • BMTF<br>• CCTF<br>• LSTF |
| XM295 Skin Decontamination Kit | Interferent | • CCTF<br>• LSTF |
| Yellow smoke<br>(dibenzo(b,def)chrysene-7,14-dione) | Interferent | • CCTF<br>• LSTF |
| Yershov mixtures | • Smoke<br>• Obscurant | Outdoors |

BMTF Bushnell Materiel Test Facility
CCTF Reginald Kendall Combined Chemical Test Facility
LSTF Lothar Salomon Life Sciences Test Facility

SOURCES: Andrulis, 1992; Bodrero, 1998; Shipley et al., 1998; White, 1999b

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX D*

*Toxicity Information About Mission Materials*

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# Toxicity Information About Mission Materials

Appendix D presents toxicity information for biological agents and simulants and chemicals either used at DPG or that could potentially be used in the future. Chemicals in this appendix include:

- Chemical agents and simulants
- Chemical agentdecontaminants
- Chemical components and combustion products of smokes, obscurants, and interferents
- Chemical components of munitions and energetics

This appendix does not include all mission materials that could potentially be used at DPG in the future such as materials requiring testing as a result of:

- New national security concerns
- Identification of new chemical agents or biological agents
- Identification of new biological or chemical simulants or smokes and obscurants that are effective for testing purposes

The use of any new mission material at DPG must undergo an environmental review process.

Toxicity or infectivity information for biological agents and simulants, and toxicity information for chemicals are presented in the following two sections:

- Toxicity or Infectivity of Biological Agents and Simulants
- Toxicity of Chemicals

## D1.0 Toxicity or Infectivity of Biological Agents and Simulants

This section presents toxicity or infectivity information about biological agents and simulants used at DPG or that could potentially be used at DPG. To understand the toxicity and infectivity information presented, the following information is provided.

The general definition of a biological agent is a biological organism or a product of that biological organism that may be harmful to humans or the environment.

Biological agents that are organisms include bacteria, viruses, protozoa, nematodes, trematodes, cestodes, fungi, and rickettsia. Biological agents that are products of organisms are toxins, which are either endotoxins or exotoxins. Endotoxins are toxic compounds released upon disintegration of the organism and exotoxins are toxic compounds released by the living organism. Enterotoxins are endotoxins or exotoxins that cause gastrointestinal symptoms. The CDC has developed the following guidelines called BLs for safe laboratory handling of biological organisms:

- BL 1 facilities, practices, and equipment are appropriate for undergraduate and secondary educational teaching laboratories where work is done with defined and characterized strains of viable microorganisms not known to consistently cause disease in healthy adult humans. *Bacillus subtilus* var. *niger* and *Erwinia herbicola* are representative of microorganisms assigned to this level.

- BL 2 facilities, practices, and equipment are applicable to clinical or diagnostic laboratories where work is done with the broad spectrum of indigenous moderate-risk agents that are present in the community and associated with human disease of varying severity. With good microbiological techniques, these agents can be used safely in activities conducted on the open bench, provided the potential for splashes or aerosols is low. Hepatitis B, *Staphylococcus aureus*, Human Immunodeficiency Virus (HIV), and *salmonella* are representative of microorganisms assigned to this level.

- BL 3 facilities, practices, and equipment are applicable to clinical, research, or production facilities in which work is done with agents with a potential for respiratory transmission, and which may cause serious and potentially lethal infection. Primary hazards to personnel working with these agents relate to autoinoculation, ingestion, and exposure to infectious aerosols. Yellow fever virus, Venezuelan equine encephalomyelitis (VEE) virus, *Mycobacterium tuberculosis*, *Bacillus anthracis*, and *Coxiella burnetii* are representative of microorganisms assigned to this level.

- BL 4 facilities, practices, and equipment are applicable for work with dangerous agents that pose a high individual risk of life-threatening disease, which may be transmitted via the aerosol route and for which there is no available vaccine or therapy. Lassa fever virus, ebola virus, and the Crimean-Congo hemorrhagic fever virus are representative of microorganisms assigned to this level.

BL categories are not applied to toxins. Instead toxins are managed as chemical hazards.

DPG does not use BL 4 organisms. All organisms used at DPG are classified as BL 1, BL 2, or BL 3. DPG can use any BL 1, BL 2, or BL 3 organism during laboratory testing and any BL 1 organism during outdoor testing that has been approved through DPG's environmental review process. BL 1 organisms approved for outdoor testing are considered biological simulants. Biological simulants at DPG consist of materials or BL 1 organisms used to mimic the traits of the biological agents being studied. Due to the extensive number of organisms that could be used at DPG, it is not possible to provide descriptions for all these biological agents. This appendix addresses only organisms that the Army has identified as most readily available to hostile forces for use as potential biological warfare agents that are tested at DPG. All biological simulants currently approved for use outdoors at DPG are also addressed.

The following types of biological organisms are being tested at DPG or could be used in the future for testing purposes:

- Bacteria – Some of the characteristics used to classify bacteria are microscopic characteristics. Using microscopic characteristics, bacteria are subdivided as nonspore-forming or spore-forming. They are further divided by shape, either rod-shaped, round, or ovoid (egg-shaped), and by staining characteristics. Gram's method is used to classify bacteria by staining characteristics. Gram-positive bacteria have peptidoglycan as their outer cell wall and stain a deep purple. Gram-negative bacteria have an outer cell wall consisting of lipopolysaccharides and proteins and do not retain the violet color of the stain.

- Viruses – Infectious agents that live inside cells of organisms that are considered parasites. Viruses can infect all living cells. Viruses infect only a limited group of host species.

- Rickettsia – Rickettsia are very similar to bacteria. They have cell walls that are typical of bacteria and resemble nonmotile round to ovoid bacteria. Nonmotile organisms do not exhibit spontaneous motion. What separates rickettsia from bacteria is that they are parasites and can only survive briefly outside animal cells. The rickettsia most people are familiar with is the rickettsia that causes Rocky Mountain spotted fever.

The following biological agents and simulants used at DPG are discussed below:

- Potential biological warfare agents
- Biological simulants approved for use outdoors

## D1.1 Potential Biological Warfare Agents Used at DPG

The organisms discussed in this section are considered by the Army to be potential biological warfare agents as defined in the *Handbook on the Medical Aspects of NBC Defensive Operations* (Army, 1996a) and are either being used at DPG or could likely be used in the future. This section also discusses one plant toxin, ricin. The toxicity of the following biological agents are described in this section:

- Bacillus anthracis
- Brucella bacteria
  - *Brucella canis*
  - *Brucella melitensi*
  - *Brucella suis*
- Clostridium botulinum
- CB
- Francisella tularensis
- Ricin toxin
- Staphylococcus aureus
- T-2 toxin
- VEE
- Vibrio cholerae
- Yersinia pestis

***Bacillus anthracis*** – *Bacillus anthracis* causes the disease anthrax. It is a gram-positive, spore-forming bacterium that, as a spore, can survive in soil for more than 40 years. *Bacillus anthracis* is found worldwide. Anthrax is generally a disease of herbivores. Cattle and sheep are the most commonly infected animals. Infection in humans does occur. The most common route of exposure for humans is the dermal route. The dermal infectious dose is approximately 10 organisms. The resulting disease is a localized boil or abscess. Infectivity through the inhalation and ingestion routes rarely occurs in humans and is usually fatal. The inhalation infectious dose may be 20,000 organisms. A vaccine is available through the CDC, but is only recommended for workers frequently handling clinical specimens. BL 2 practices are recommended for all manipulations of cultures and experimental animal studies. BL 3 practices are recommended when work involves production or concentration of cultures or could result in aerosol production.

***Brucella canis; Brucella melitensis; Brucella suis*** – These three bacterial species cause the disease brucellosis. *Brucella* is a small, round to ovoid, gram-negative,

nonmotile, aerobic bacterium that lives within monocytes and macrophages. Monocytes and macrophages are both part of the human defense mechanism that protects humans against bacterial infection. The natural reservoir is domestic animals including goats, sheep, camels, cattle, pigs, and dogs. Human infection is usually via inhalation, ingestion, or dermal exposure with broken skin. There does not appear to be any human-to-human transmission of this bacterium. The disease is a fever-producing disease with chills, sweats, headache, fatigue, muscle and joint pain, and loss of appetite. The disease is rarely fatal and is successfully treated with a number of antibiotics. BL 3 practices are recommended for all manipulations of cultures and for experimental animal studies.

***Clostridium botulinum*** – *Clostridium botulinum* is an anaerobic, spore-forming bacterium. This rod-shaped bacterium produces seven distinct neurotoxins under specific growth conditions. These neurotoxins are proteins which bind to the membrane of neurons and prevent release of the enzyme acetylcholine. Symptoms of exposure to the toxins include generalized weakness, lassitude, and dizziness. Respiratory failure due to paralysis of the respiratory muscles is the most serious complication and is generally the cause of death. An experimental antitoxin is available through the CDC. BL 2 practices are recommended for all activities with materials that may contain the toxin. BL 3 practices are recommended for all activities that may result in droplet or aerosol production.

***Coxiella burnetii*** – CB is a rickettsia responsible for the disease Q fever. This organism occurs worldwide and is widespread throughout Utah. Natural infections have been documented in ticks, body lice, many wild and domesticated mammals, and birds. The organism is highly infective. The infectious inhalation dose resulting in 25 to 50 percent infectivity is estimated at 10 organisms. In humans, Q fever resembles a typical pneumonia that is rarely fatal. BL 2 practices are recommended for nonpropagative laboratory procedures, and BL 3 practices are recommended for activities involving inoculation, incubation, and harvesting of cultures.

***Francisella tularensis*** – *Francisella tularensis* causes the disease tularemia. This gram-negative, rod-shaped bacterium occurs worldwide and produces disease in many warm-blooded animals, including humans. *Francisella tularensis* is very infective. The human 25 to 50 percent infectious dose is approximately 10 organisms by both the inhalation and dermal routes. There is a live attenuated (weakened) vaccine available that is considered very effective. BL 3 practices are recommended for all manipulations of cultures and experimental animal studies.

**Ricin toxin** – Ricin toxin is a glycoprotein from the seed of the castor plant. Its main toxic effect is by altering ribosomal nucleic acid and preventing protein synthesis. Symptoms of ricin toxin ingestion include rapid onset of nausea, vomiting, abdominal cramps, severe diarrhea with vascular collapse, and death occurring on the third day or later. *Biosafety in Microbiological and Biomedical Laboratories* (CDC, 1993) does not provide biosafety recommendations for ricin toxin.

***Staphylococcus aureus*** – *Staphylococcus aureus* is the bacterium responsible for producing SEB. This exotoxin causes food poisoning when ingested. Pulmonary exposure results in a distinct syndrome and causes significant illness. *Biosafety in Microbiological and Biomedical Laboratories* (CDC, 1993) does not provide biosafety recommendations for *Staphylococcus aureus*.

**T-2 toxin** – T-2 toxin is a trichothecene mycotoxin. Trichothecene mycotoxins are a diverse group of more than 40 compounds produced by fungi. They are potent inhibitors of protein synthesis and impair deoxyribonucleic acid synthesis, alter cell membrane structure and function, and inhibit mitochondrial respiration. Ingestion of mycotoxins results in weight loss, vomiting, skin inflammation, bloody diarrhea, diffuse hemorrhage, and possibly death. *Biosafety in Microbiological and Biomedical Laboratories* (CDC, 1993) does not provide biosafety recommendations for trichothecene mycotoxins.

**Venezuelan Equine Encephalomyelitis** – The virus that causes VEE belongs to a family of arboviruses (arthropod-borne viruses). VEE occurs in South and Central America, Trinidad, and Florida. It is a mosquito-borne viral disease that infects equine species and humans. Infection in humans usually results in a mild influenza-like disease with little or no central nervous system involvement. Immunization for high-risk personnel is available. BL 3 practices are recommended for VEE.

***Vibrio cholerae*** – *Vibrio cholerae* is a short, gram-negative, rod-shaped bacterium that causes the disease cholera. Human exposure is through ingestion. Once ingested, the bacterium multiplies in the intestine and secretes an enterotoxin that causes diarrhea. Vomiting may be present early in the disease and interfere with fluid replacement therapy. BL 2 practices are recommended for all cultures and experimental animal studies.

***Yersinia pestis*** – *Yersinia pestis* is a round to oval, gram-negative organism that, under natural conditions, infects fleas. It is the organism that causes the plague. Humans become infected by coming in contact with infected rodents and their fleas. When the disease is transmitted through fleas, the resulting disease is known as

bubonic plague. In untreated patients, mortality is approximately 50 percent. Another form of the disease is pneumonic plague and is the result of inhalation of the bacterium. Although a much rarer form of transmission, pneumonic plague has a 100 percent mortality rate in untreated patients. There is a licensed vaccine for the plague. BL 2 practices are recommended for all cultures and experimental animal studies. BL 3 practices are recommended for activities that may result in droplet or aerosol production.

## D1.2 Biological Simulants Approved for Use Outdoors at DPG

The materials described in this section are biological simulants approved for use outdoors at DPG. A biological simulant is an organism or material used to simulate the behavior of a biological agent. For use outdoors, an organism must be a BL 1 organism, have no known harmful effects on humans or the environment, and be approved through DPG's environmental review process. The three organisms currently used in outdoor testing at DPG to simulate biological agents include *Bacillus subtilis*; BG, MS2, and EH. DPG also uses three materials to simulate biological agents in outdoor testing that are not organisms but share characteristics of organisms or their toxins and have no known harmful effects on humans or the environment. They include kaolin dust, ovalbumin, and bovine serum albumin.

***Bacillus subtilis*; *Bacillus subtilis* var. *niger*** – *Bacillus subtilis* and its variant BG are organisms commonly found in soil, water, and air. They are gram-positive, spore-forming bacteria that are considered harmless. Concentrations of BG occurring naturally in desert soil have been measured at 100,000 spores per gram of surface soil.

**MS2 Bacteriophage** – MS2 is a lytic picorna bacteriophage, a bacterial virus, and will only grow in certain strains of *Escherichia coli*. It has been used as an open air test simulant for pathogenic viruses. There are no known environmental impacts or adverse health effects associated with this bacteriophage.

***Erwinia herbicola*** – EH is a rod-shaped, gram-negative bacterium with flagella. It lives on the surface of plants, and does not cause disease. It has been reported to decrease the effects of fireblight on apples and pears. No adverse effects have been reported for animals.

**Kaolin dust** – Kaolin dust, also known as China clay and hydrated silicate, is a naturally occurring aluminum silicate clay. It is a nontoxic, nuisance dust and does not have a significant impact on human health or the environment.

**Ovalbumin** – OVA is the main protein in egg white. Effects on human health are primarily due to allergic responses referred to as "egg allergy." This type of allergic reaction occurs from skin contact, injection, inhalation, or ingestion of OVA. Sensitivity to OVA in the work place is referred to as "occupational asthma" and the sensitivity may be related to genetic predisposition.

**Bovine serum albumin** – Bovine serum albumin is the most abundant protein in cattle plasma. It is naturally produced in the body of cattle and is considered nontoxic.

## D2.0 Toxicity of Chemicals

This section presents the relative toxicity of chemicals used at DPG. Toxicity information for chemicals in this appendix is presented as "relative" toxicity which means the information is only meaningful when it is used to compare the toxicity of one chemical to other chemicals. The toxicity of a chemical can be defined by the adverse effect of a chemical on a biological system. Toxicity of any chemical is dependent on dose, exposure, and the species affected. No chemical is a safe chemical. However, chemicals can be used safely by limiting either the dose or exposure.

Toxicity is also related to duration of exposure. Acute toxicity is the description of adverse effects after a single exposure. Subchronic or chronic toxicity is a description of adverse effects after multiple exposures over time. Because information about the dose producing acute toxicity of chemicals is easy to compare, this appendix presents information about the dose that produces acute toxicity for the selected chemicals used at DPG. However, if a chemical is thought to produce cancer after multiple exposures over time, that information is also presented.

This appendix uses two measures of acute toxicity:

- Amount of a chemical that results in death reported as the lethal dose
- Amount of a chemical that produces an adverse health effect reported as toxic dose

Data presented in this appendix also compare routes of exposure, including:

- Inhalation
- Ingestion
- Dermal – absorption through the skin
- Subcutaneous – injection just under the skin

- Intravenous – injection into a vein
- Intramuscular – injection into a muscle
- Intraperitoneal – injection into the cavity surrounding the internal digestive organs

Because the body reacts differently with different routes of exposure, when comparing the relative toxicity of chemicals, data from the same route of exposure must be compared. An intravenous dose is considered to be 100 percent absorbed. There are no biological barriers to prevent it from reacting with all parts of the body, whereas a chemical put on the skin (dermal exposure) may not be completely absorbed because the skin may act as a barrier.

Doses for inhalation exposure are presented as concentrations in air in $mg/m^3$. The units for measuring doses for all other routes of exposure are milligrams per kilogram body weight (mg/kg).

Many species of experimental animals are used to determine the dose or concentration required to produce the adverse health effect. Because species sensitivity to a chemical varies, the data presented were selected using the following criteria in the following order.

1. All data about toxicity to humans are presented.

2. If monkeys were used as an experimental animal, those data are presented in preference to any other mammalian species.

3. The lowest dose or concentration reported for each exposure route for all other mammalian is presented.

All information presented in this appendix is from the Registry of Toxic Effects of Chemical Substances (RTECS) database maintained by the National Institute of Occupational Safety and Health (NIOSH, 1999). The RTECS database is an up-to-date compendium of toxicity information presented in the scientific literature. RTECS was originally compiled in 1971 by NIOSH in response to the Occupational Health and Safety Act of 1970 and is updated quarterly.

Information about human toxicity presented in this appendix is from accidental exposure. Doses reported include lowest toxic concentrations (TCLo) in air and lowest toxic doses (TDLo). If a toxic concentration or dose is reported in this appendix, the adverse health effect that was reported in the literature cited in the RTECS database is also presented. Potential carcinogens are also identified.

Information about the toxicity to all other mammals was selected by presenting the lethal concentration (LC) or lethal dose (LD). If experimental data reported the concentration or dose that resulted in the death of 50 percent of the animals (LC50 or LD50), those data are presented in this appendix. However, if an LC50 or LD50 was not reported, the lowest concentration (LCLo) or dose (LDLo) that resulted in death is presented in this appendix. LC50s and LD50s were selected preferentially because individual variability within the species is more likely to affect an LCLo or LDLo than an LD50 or LC50.

The relative toxicity data for all chemical agents tested at DPG or that could likely be used in the future are presented in Table D-1, Toxicity Information for Chemical Agents. A chemical agent is a chemical substance intended for use in military operations to kill, seriously injure, or incapacitate people because of its physiological effects. Excluded from this definition are riot control agents, herbicides, smoke, and flame (Army, 1996a).

Relative toxicity data for the chemical decontamination solutions routinely used at DPG to detoxify chemical agents are presented in Table D-2, Toxicity Information for Chemical Agent Decontaminants.

Relative toxicity data for the chemical simulants used routinely in testing at DPG are presented in Table D-3, Toxicity Information for Chemical Simulants. Chemical simulants are substances with physical properties that resemble physical properties of chemical agents but are not as toxic.

Relative toxicity data on chemicals that are constituents of smokes, interferents, and obscurants that are used at DPG in outdoor testing or could likely be used in the future are presented in Table D-4, Toxicity Information for the Chemical Components and Combustion Products of Smokes and Obscurants. Generally, smokes, obscurants, and interferents are mixtures of multiple chemicals. Individual chemicals are listed because there is little toxicity information available on mixtures of chemicals.

Relative toxicity data on the chemicals that are constituents of munitions used at DPG are presented in Table D-5, Toxicity Information for the Chemical Components of Munitions and Energetics. Generally, munitions contain mixtures of multiple compounds. Individual chemicals are listed because there is little toxicity information available on mixtures of chemicals. For most of the chemicals found in munitions, safety is at least as important as toxicity. Most of the materials are explosive and if a reaction is initiated, the resulting explosion could cause physical harm.

**Table D-1. Toxicity Information for Chemical Agents.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Arsine (SA) | Inhalation | TCLo<br>LCLo<br>LC50 | 9.5 mg/m$^3$<br>79 mg/m$^3$/30 minutes<br>250 mg/m$^3$/10 minutes | Human<br>Human<br>Mouse | Rupture of red blood cells |
| | Intraperitoneal | LD50 | 2 mg/kg | Cat | Toxic studies not reported |
| Bis(2-(2-chloroethylthio)) ethyl ether (T) | Inhalation | LCLo | 400 mg/m$^3$ | Human | Toxic studies not reported |
| Bis(2-chloroethyl) ethylamine (or Nitrogen Mustard, Type 1 (HN1)) | Ingestion | LD50 | 2.5 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LD50 | 13 mg/kg | Mouse | Toxic studies not reported |
| | Subcutaneous | LD50 | 1.1 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LD50 | 2 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 1 mg/kg | Mouse | Toxic studies not reported |
| Bis(2-chloroethyl) sulfide with 30 percent sulfur-based impurities (or Levinstein Mustard (H)) | Inhalation | LCLo<br>TCLo<br>LC50 | 149 mg/m$^3$/10 minutes<br>0.1 mg/m$^3$/1 year<br>80 mg/m$^3$/10 minutes | Human<br>Rat<br>Dog<br>Monkey | Carcinogenic; corneal damage |
| | Ingestion | TDLo | 20 mg/kg for 7 days | Rat | Fetotoxicity |
| | Dermal | LDLo<br>LD50 | 64 mg/kg<br>20 mg/kg | Human<br>Dog<br>Guinea Pig | Toxic studies not reported |
| | Subcutaneous | LDLo<br>LD50 | 5 mg/kg<br>20 mg/kg | Dog<br>Rabbit<br>Guinea Pig<br>Mouse | Toxic studies not reported |
| | Intravenous | LD50 | 0.2 mg/kg | Dog | Toxic studies not reported |
| Carbon dichloride oxide (or Phosgene (CG)) | Inhalation | TCLo<br>LCLo | 100 mg/m$^3$/30 minutes<br>203 mg/m$^3$/5 minutes | Human<br>Human | Delayed pulmonary edema |
| Cyanogen chloride (CK) | Inhalation | TCLo | 10 mg/m$^3$ | Human | Tearing, conjunctiva irritation; chronic pulmonary edema or congestion |
| | Ingestion | LD50 | 6 mg/kg | Cat | Toxic studies not reported |
| | Subcutaneous | LDLo | 5 mg/kg | Dog | Toxic studies not reported |
| Cyclohexyl methyl phosphonofluoridate (or Cyclosarin (GF or EA1212)) | Subcutaneous | LD50 | 0.1 mg/kg | Rabbit<br>Guinea Pig | Toxic studies not reported |
| Dichloro (2-chlorovinyl) arsine (or Lewisite) | Inhalation | LCLo | 50 mg/m$^3$/30 minutes | Human | Toxic studies not reported |
| | Ingestion | TDLo | 8.4 mg/kg for 14 days | Rabbit | Fetotoxicity |
| | Dermal | LD50 | 12 mg/kg | Mouse<br>Guinea Pig | Toxic studies not reported |
| | Subcutaneous | LD50 | 1 mg/kg | Rat<br>Guinea Pig | Toxic studies not reported |
| | Intravenous | LD50 | 0.5 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LDLo | 2 mg/kg | Guinea Pig | Toxic studies not reported |

**Table D-1. Toxicity Information for Chemical Agents.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Ethyl N, N-dimethylphosphoroamido cyanidate (or Tabun (GA)) | Inhalation | LCLo<br>LC50 | 150 mg/m$^3$<br>15 mg/m$^3$/30 minutes | Human<br>Mouse | Toxic studies not reported |
| | Ingestion | LD50 | 0.2 mg/kg | Dog | Toxic studies not reported |
| | Dermal | LDLo<br>LD50 | 23 mg/kg<br>9.3 mg/kg | Human<br>Monkey | Toxic studies not reported |
| | Subcutaneous | LD50<br>TDLo | 0.07 mg/kg<br>8.5 mg/kg | Monkey<br>Rat | Degenerative changes of neural tissue; decreased true cholinesterase |
| | Intravenous | LDLo<br>LD50 | 0.014 mg/kg<br>0.047 mg/kg | Human<br>Cat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 0.49 mg/kg | Rat | Toxic studies not reported |
| | Intramuscular | LD50 | 0.034 mg/kg | Monkey | Toxic studies not reported |
| Hydrogen cyanide (AC) | Inhalation | TCLo<br>LCLo<br>LC50 | 500 mg/m$^3$/3 minutes<br>120 mg/m$^3$/1 hour<br>177 mg/m$^3$/30 minutes | Human<br>Human<br>Rat | Excessive dilation of the pupil; respiratory depression; coma |
| | Ingestion | LDLo<br>LD50 | 0.57 mg/kg<br>3.7 mg/kg | Human<br>Mouse | Toxic studies not reported |
| | Subcutaneous | LDLo | 1 mg/kg | Human | Toxic studies not reported |
| | Intravenous | TDLo<br>LD50 | 0.055 mg/kg<br>1.3 mg/kg | Human<br>Monkey | Respiratory stimulation |
| | Intraperitoneal | LD50 | 1.6 mg/kg | Rabbit | Toxic studies not reported |
| | Intramuscular | LD50 | 0.486 mg/kg | Rabbit | Toxic studies not reported |
| Isopropyl methylphosphonofluoridate (or Sarin (GB)) | Inhalation | TCLo<br>LC50 | 0.09 mg/m$^3$<br>5 mg/m$^3$/30 minutes | Human<br>Mouse | Excessive contraction of the pupil of the eye; decreased true cholinesterase; nausea |
| | Ingestion | TDLo<br>LD50 | 0.002 mg/kg<br>0.55 mg/kg | Human<br>Rat | Muscle weakness; Bronchiolar constriction, including asthma |
| | Dermal | LD50 | 28 mg/kg | Human | Toxic studies not reported |
| | Subcutaneous | TDLo<br>LD50 | 1 mg/kg/40 days<br>30,000 mg/kg | Rat<br>Cat<br>Guinea Pig<br>Rabbit | Convulsions |
| | Intravenous | LD50 | 0.015 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 0.218 mg/kg | Rat | Toxic studies not reported |
| | Intramuscular | LD50 | 0.022 mg/kg | Monkey | Toxic studies not reported |
| O-ethyl-S-(2-diisopropylaminoethyl) methylphosphonothioate (VX) | Ingestion | TDLo | 0.004 mg/kg | Human | Hypermobility of the gastrointestinal tract; diarrhea; nausea or vomiting |
| | Dermal | LDLo | 0.086 mg/kg | Human | Spastic paralysis with sensory change; bronchiolar constriction including asthma |
| | Subcutaneous | TDLo<br>LD50 | 0.03 mg/kg<br>0.008 mg/kg | Human<br>Guinea Pig | Headache; nausea or vomiting; decreased true cholinesterase |
| | Intravenous | TDLo<br>LD50 | 0.001 mg/kg<br>0.005 mg/kg | Human<br>Cat | Hallucinations, distorted perceptions; elevated blood pressure |
| | Intraperitoneal | LD50 | 0.05 mg/kg | Rat | Toxic studies not reported |
| | Intramuscular | TDLo | 0.003 mg/kg | Human | Visual field changes; interference with sleep; nausea or vomiting |

**Table D-1. Toxicity Information for Chemical Agents.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| O-ethyl-S-(2-dimethylaminoethyl) methylphosphonothioate (VX or EA 1699) | Ingestion | LD50 | 0.122 mg/kg | Rat | Toxic studies not reported |
| | Intravenous | LD50 | 0.17 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 0.05 mg/kg | Mouse | Toxic studies not reported |
| | Intramuscular | LD50 | 0.021 mg/kg | Rat | Toxic studies not reported |
| Pinacolyl methylphosphonofluoridate (or Soman (GD)) | Inhalation | LCLo | 70 $mg/m^3$ | Human | Toxic studies not reported |
| | Dermal | LDLo | 18 mg/kg | Human | Toxic studies not reported |
| | Subcutaneous | TDLo<br>LD50 | 0.025 mg/kg/10 days<br>0.013 mg/kg | Cat<br>Monkey | Sensory change involving peripheral nerves |
| | Intravenous | LD50 | 0.015 mg/kg | Cat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 0.098 mg/kg | Rat | Toxic studies not reported |
| | Intramuscular | TDLo<br>LD50 | 8.5 mg/kg<br>0.007 mg/kg | Rat<br>Monkey | Degenerative changes of neural tissue |
| Tris(2-chloroethyl) amine (or Nitrogen Mustard, Type 3 ($HN_3$)) | Inhalation | LC50 | 200 $mg/m^3$/10 minutes | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 5 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LD50 | 1 mg/kg | Dog | Toxic studies not reported |
| | Subcutaneous | LD50 | 2 mg/kg | Rat | Toxic studies not reported |
| | Intravenous | LDLo | 1 mg/kg | Dog | Toxic studies not reported |

LCLo lowest published lethal concentration
LC50 lethal concentration resulting in 50 percent mortality
LDLo lowest published lethal dose
LD50 lethal dose resulting in 50 percent mortality
mg/kg milligrams per kilogram
$mg/m^3$ milligrams per cubic meter
TCLo lowest published toxic concentration
TDLo lowest published toxic dose

SOURCE: NIOSH, 1999

**Table D-2. Toxicity Information for Chemical Agent Decontaminants.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Ammonia ($NH_4OH$) | Inhalation | TCLo<br>LCLo<br>LC50 | 14.2 $mg/m^3$<br>3,500 $mg/m^3$/5 minutes<br>1,420 $mg/m^3$/4 hours | Human<br>Human<br>Rat | Ulcerated nasal septum; eye irritation |
| | Unreported | LDLo | 132 mg/kg | Human | Toxic studies not reported |
| Calcium hypochlorite or high test hypochlorite (HTH) | Ingestion | LD50 | 850 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LDLo | 2,000 mg/kg | Rabbit | Toxic studies not reported |
| Sodium carbonate ($Na_2CO_3$) | Ingestion | LD50 | 2,050 mg/kg | Mouse | Toxic studies not reported |

**Table D-2. Toxicity Information for Chemical Agent Decontaminants.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Sodium hydroxide (NaOH) | Ingestion | LDLo | 500 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 40 mg/kg | Mouse | Toxic studies not reported |
| Sodium hypochlorite (NaOCl) or household bleach | Ingestion | TDLo<br>LD50 | 1,000 mg/kg<br>5,800 mg/kg | Human<br>Mouse | Sleepiness; lowered blood pressure; corrosive to skin |
| | Intravenous | TDLo | 45 mg/kg | Human | Nausea; respiratory changes |
| Supertropical bleach (STB) | STB has similar toxicity to sodium hypochlorite. | | | | |

LCLo lowest published lethal concentration
LC50 lethal concentration resulting in 50 percent mortality
LDLo lowest published lethal dose
LD50 lethal dose resulting in 50 percent mortality
mg/kg milligrams per kilogram
$mg/m^3$ milligrams per cubic meter
TCLo lowest published toxic concentration
TDLo lowest published toxic dose

SOURCE: NIOSH, 1999

**Table D-3. Toxicity Information for Chemical Simulants.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Acetic acid | Unreported | LDLo | 308 mg/kg | Human | Toxic studies not reported |
| | Inhalation | TCLo<br>LC50 | 2,000 $mg/m^3$<br>13,800 $mg/m^{3/}$1 hour | Human<br>Mouse | Olfaction effects; tearing |
| | Ingestion | TDLo<br>LDLo | 1.5 mg/kg<br>600 mg/kg | Human<br>Rabbit | Ulceration of the intestine |
| | Dermal | LD50 | 1.1 ml/kg | Rabbit | Toxic studies not reported |
| | Subcutaneous | LDLo | 600 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LD50 | 525 mg/kg | Mouse | Toxic studies not reported |
| Butane | Inhalation | LC50 | 658,000 $mg/m^3$/4 hours | Rat | Toxic studies not reported |
| Diethyl malonate (DEM) | Ingestion | LD50 | 6,400 mg/kg | Mouse | Toxic studies not reported |
| Fluorescent particles (FP) | -- | -- | -- | -- | -- |
| Methyl salicylate (MeS) | Ingestion | LDLo<br>LD50 | 101 mg/kg<br>700 mg/kg | Human<br>Guinea Pig | Toxic studies not reported |
| | Subcutaneous | LDLo | 1,500 mg/kg | Guinea Pig | Toxic studies not reported |
| Propane | Inhalation | Propane is toxic as an asphyxiant. | | | |
| Propylene | Inhalation | Propylene is toxic as an asphyxiant. | | | |
| Sulfur hexafluoride ($SF_6$) | Intravenous | LD50 | 5,790 mg/kg | Rabbit | Toxic studies not reported |

**Table D-3. Toxicity Information for Chemical Simulants.**

| Name (Abbreviation) | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Triethyl phosphate (TEP) | Inhalation | LCLo | 208,000 mg/m$^3$/6 hours | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 1,300 mg/kg | Rat | Toxic studies not reported |
| | Intravenous | LDLo | 1,000 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 485 mg/kg | Mouse | Toxic studies not reported |

-- Information was not available on the Registry of Toxic Effects of Chemical Substances.
> greater than

LCLo lowest published lethal concentration
LC50 lethal concentration resulting in 50 percent mortality
LDLo lowest published lethal dose
LD50 lethal dose resulting in 50 percent mortality
mg/kg milligrams per kilogram
mg/m$^3$ milligrams per cubic meter
TCLo lowest published toxic concentration
TDLo lowest published toxic dose

SOURCE: NIOSH, 1999

**Table D-4. Toxicity Information for the Chemical Components and Combustion Products of Smokes and Obscurants.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| 1-Aminoanthraquinone | Intraperitoneal | LD50 | 1,500 mg/kg | Rat | Toxic studies not reported |
| 1-Methylaminoanthraquinone (red smoke) | -- | -- | -- | -- | -- |
| 1,4-di-p-Toluidino-anthraquinone (violet smoke) | Ingestion | LD50 | > 5,000 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LD50 | > 2,000 mg/kg | Rabbit | Toxic studies not reported |
| 7H-benz(de)anthracen-7-one (green smoke) | Intraperitoneal | LD50 | 290 mg/kg | Mouse | Toxic studies not reported |
| Ammonium chloride | Ingestion | LDLo<br>LD50 | 2,000 mg/kg<br>1,300,000 mg/kg | Human<br>Mouse | Toxic studies not reported |
| | Subcutaneous | LDLo | 72 mg/kg | Guinea Pig | Toxic studies not reported |
| | Intravenous | LD50 | 358 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD50 | 485 mg/kg | Mouse | Toxic studies not reported |
| | Intramuscular | LD50 | 30 mg/kg | Rat | Toxic studies not reported |
| Anthracene | Ingestion | LDLo | > 17,000 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD50 | 430 mg/kg | Mouse | Toxic studies not reported |

**Table D-4. Toxicity Information for the Chemical Components and Combustion Products of Smokes and Obscurants.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Benzene | Inhalation | TCLo<br>LCLo<br>LC50 | 318 mg/m$^3$<br>65 mg/m$^3$/5 years<br>31,820 mg/m$^3$ | Human<br>Human<br>Mouse | This compound is carcinogenic. |
| | Ingestion | LDLo<br>LD50 | 50 mg/kg<br>930 mg/kg | Human<br>Rat | Toxic studies not reported |
| | Dermal | LD50 | 48 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LDLo | 88 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 340 mg/kg | Mouse | Toxic studies not reported |
| Brass powder | Ingestion | LD50 | 1,561 mg/kg | Rat | Toxic studies not reported |
| Carbon disulfide | Unreported | LDLo | 186 mg/kg | Human | Toxic studies not reported |
| | Inhalation | TCLo<br>LCLo<br>LC50 | 40 mg/m$^3$/91 weeks<br>6,215 mg/m$^3$/5 hours<br>10,000 mg/m$^3$/2 hours | Human<br>Human<br>Mouse | Decreased production of sperm |
| | Ingestion | LD50 | 2,125 mg/kg | Guinea Pig | Toxic studies not reported |
| | Intraperitoneal | LDLo | 400 mg/kg | Guinea Pig | Toxic studies not reported |
| Chlorobenzene | Inhalation | LC50 | 13,600 mg/m$^3$ | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 1,110 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LDLo | > 2,200 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 515 mg/kg | Mouse | Toxic studies not reported |
| Chlorosulfonic acid | Inhalation | LCLo | 926 mg/m$^3$/1 hour | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 50 mg/kg | Rat | Toxic studies not reported |
| Dibenzo(b,def)chrysene-7,14-dione (yellow smoke) | Intraperitoneal | LD50 | 2,270 mg/kg | Mouse | This compound may be carcinogenic by the oral route. |
| Diesel fuel number 2 (middle distillate fuels) | Ingestion | LD50 | 7,500 mg/kg | Rat | Toxic studies not reported |
| Dust | -- | -- | -- | -- | -- |
| Fog oil (middle distillate fuels) | Ingestion | LD50 | 7,500 mg/kg | Rat | Toxic studies not reported |
| Hexachlorobenzene | Unreported | LDLo | 220 mg/kg | Human | Toxic studies not reported |
| | Inhalation | LC50 | 1,600 mg/m$^3$ | Cat | Toxic studies not reported |
| | Ingestion | LD50 | 1,700 mg/kg | Cat | This compound may be carcinogenic by the oral route. |
| Hexachloroethane smoke | Inhalation | LCLo | 57,000 mg/m$^3$/8 hours | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 4,460 mg/kg | Rat | This compound may be carcinogenic by the oral route. |
| | Dermal | LD50 | 32,000 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LDLo | 325 mg/kg | Dog | Toxic studies not reported |
| | Intraperitoneal | LD50 | 4,500 mg/kg | Mouse | Toxic studies not reported |

**Table D-4. Toxicity Information for the Chemical Components and Combustion Products of Smokes and Obscurants.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| JP-4, JP-5, and JP-8 fuels | Inhalation | LC50 | > 4,440 mg/m$^3$ | Guinea pig | Toxic studies not reported |
| | Ingestion | LDLo | 500 mg/kg | Mouse | Toxic studies not reported |
| | Dermal | LDLo | > 2,000 mg/kg | Rabbit | Toxic studies not reported |
| Napthalene | Ingestion | TDLo | 1,680 mg/kg | Rat | Changes in adrenal gland weight |
| Polyethylene glycol (PEG)[1] | Inhalation | TCLo | 567 mg/m$^3$/2 weeks | Rat | Changes in lung weight; weight loss |
| | Ingestion | LD50 | 600 mg/kg | Rat | Toxic studies not reported |
| | Subcutaneous | LD50 | 8,000 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LDLo | 7.9 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD50 | 473 mg/kg | Mouse | Toxic studies not reported |
| Potassium chlorate | Unreported | LDLo | 429 mg/kg | Human | Toxic studies not reported |
| | Ingestion | LD50 | 1,870 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LDLo | 1,500 mg/kg | Rat | Toxic studies not reported |
| Red phosphorus (RP) | Unreported | LDLo | 4.4 mg/kg | Human | Toxic studies not reported |
| Sodium chlorate | Unreported | LDLo | 185 mg/kg | Human | Toxic studies not reported |
| | Ingestion | TDLo<br>LD50 | 286 mg/kg<br>1,200 mg/kg | Human<br>Rat | Cyanosis; changes in cell count; methemoglobinemia |
| | Dermal | LD50 | > 10,000 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 596 mg/kg | Mouse | Toxic studies not reported |
| Styrene | Inhalation | LC50 | 9,500 mg/m$^3$/4 hours | Mouse | Toxic studies not reported |
| | Ingestion | LD50 | 316 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LD50 | 90 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD50 | 660 mg/kg | Mouse | Toxic studies not reported |
| Sulfur | Inhalation | LC50 | 1,660 mg/m$^3$ | Mammal | Toxic studies not reported |
| | Ingestion | LDLo | 175 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LDLo | 5 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LDLo | 55 mg/kg | Guinea pig | Toxic studies not reported |
| Sulfuric acid (fuming) | Inhalation | LC50 | 2,530 mg/m$^3$/1 hour | Rat | Toxic studies not reported |
| Terephthalic acid | Ingestion | LD50 | 3,200,000 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LDLo | 767 mg/kg | Dog | Toxic studies not reported |
| | Intraperitoneal | LD50 | 1,430 mg/kg | Mouse | Toxic studies not reported |
| Toluene | Inhalation | TCLo<br>LC50 | 376 mg/m$^3$<br>1,500 mg/m$^3$/24 hours | Human<br>Mouse | Hallucinations; distorted perceptions; change in motor activity |
| | Ingestion | LDLo<br>LD50 | 50 mg/kg<br>636 mg/kg | Human<br>Rat | Toxic studies not reported |
| | Subcutaneous | LD50 | 2,250 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LD50 | 1,960 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 59 mg/kg | Mouse | Toxic studies not reported |

**Table D-4. Toxicity Information for the Chemical Components and Combustion Products of Smokes and Obscurants.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| White phosphorus (WP) | Ingestion | TDLo<br>LDLo<br>LD50 | 11 mg/kg<br>1.4 mg/kg<br>3.0 mg/kg | Human<br>Human<br>Rat | Cyanosis; hypermobility of the gastrointestinal tract; nausea; increased body temperature |

1 PEG is a group of polymers that range in molecular weight from 200 to 4,000,000. The toxicity data reported are the lowest reported value for any of the molecular weights tested.

-- Information was not available on the Registry of Toxic Effects of Chemical Substances.
> greater than

LCLo lowest published lethal concentration
LC50 lethal concentration resulting in 50 percent mortality
LDLo lowest published lethal dose
LD50 lethal dose resulting in 50 percent mortality
mg/kg milligrams per kilogram
$mg/m^3$ milligrams per cubic meter
TCLo lowest published toxic concentration
TDLo lowest published toxic dose

SOURCE: NIOSH, 1999

**Table D-5. Toxicity Information for the Chemical Components of Munitions and Energetics.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Alizarin dye | -- | This compound is classified as a skin and eye irritant. | | -- | -- |
| Aluminum | -- | This compound is an irritant as a dust. | | -- | -- |
| Ammonium picrate | -- | -- | -- | -- | -- |
| Barium chromate | -- | This compound is considered a carcinogen. | | -- | -- |
| Benzoic acid | Inhalation | LC50 | > 26 $mg/m^3$/1 hour | Rat | Toxic studies not reported |
| | Ingestion | LDLo | 500 mg/kg | Human | Toxic studies not reported |
| | Dermal | TDLo | 6 mg/kg | Human | Shortness of breath; Allergic dermatitis |
| Brass powder | Ingestion | LD50 | 1,561 mg/kg | Rat | Toxic studies not reported |
| Cabosil | -- | -- | -- | -- | -- |
| Calcium carbonate | -- | This compound is an irritant as a dust. | | -- | -- |
| Calcium stearate | Inhalation | LCLo | > 1,241 $mg/m^3$/4 hours | Mammal | Toxic studies not reported |
| | Ingestion | LDLo | > 10,000 mg/kg | Rat; Mouse | Toxic studies not reported |
| | Intraperitoneal | LDLo | > 10,000 mg/kg | Mouse | Toxic studies not reported |
| Carbon black | Inhalation | TCLo | 11.6 $mg/m^3$ /18 hours 2 years | Rat | Tumorigenic |
| | Ingestion | LD50 | > 15,400 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LD50 | > 3,000 mg/kg | Rabbit | Toxic studies not reported |
| Centralite (ethyl centralite) | Ingestion | LD50 | 2,500 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD50 | 200 mg/kg | Mouse | Toxic studies not reported |

**Table D-5. Toxicity Information for the Chemical Components of Munitions and Energetics.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| Cryolite | Ingestion | LD50 | > 50,000 mg/kg | Rat | Toxic studies not reported |
| Cyclo-1,3,5-trimethylene-2,4,6-trinitramine (RDX) | Ingestion | TDLo<br>LD50 | 85 mg/kg<br>59 mg/kg | Human<br>Mouse | Convulsions |
| | Intravenous | LD50 | 19 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LDLo | 10 mg/kg | Rat | Toxic studies not reported |
| Dibutylphthalate | Inhalation | LC50 | 2,500 mg/m$^3$/2 hours | Mouse | Toxic studies not reported |
| | Ingestion | TDLo<br>LD50 | 140 mg/kg<br>5,280 mg/kg | Human<br>Mouse | Hallucinations; nausea |
| | Dermal | LDLo | 6,000 mg/kg | Rat | Toxic studies not reported |
| | Intravenous | LD50 | 720 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD50 | 3,570 mg/kg | Mouse | Toxic studies not reported |
| | Intramuscular | LD50 | > 8,000 mg/kg | Rat | Toxic studies not reported |
| Dinitrotoluene | Inhalation | LC50 | 240 mg/m$^3$/6 hours | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 177 mg/kg | Rat | Toxic studies not reported |
| Diphenylamine | Ingestion | LD50 | 300 mg/kg | Guinea Pig | Toxic studies not reported |
| Graphite | -- | This compound is an irritant as a dust. | | -- | -- |
| Isopropyl alcohol | Unreported | LDLo<br>TDLo | 2,770 mg/kg<br>1,375 mg/kg | Human<br>Human | Hallucinations, distorted perception |
| | Inhalation | LD50 | 39,300 mg/m$^3$/8 hours | Rat | Toxic studies not reported |
| | Ingestion | TDLo<br>LDLo<br>LD50 | 223 mg/kg<br>3,570 mg/kg<br>3,600 mg/kg | Human<br>Human<br>Mouse | Hallucinations; decreased blood pressure; depressed pulse |
| | Dermal | LD50 | 12,800 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LD50 | 1,184 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 667 mg/kg | Rabbit | Toxic studies not reported |
| Isopropylamine | Inhalation | LC50 | 9,650 mg/m$^3$/4 hours | Rat | Toxic studies not reported |
| | Ingestion | LD50 | 820 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LD50 | 380 mg/kg | Rabbit | Toxic studies not reported |
| Lead azide | Intraperitoneal | LDLo | > 150 mg/kg | Rat | Toxic studies not reported |
| Nickel | Ingestion | LDLo | 5,000 mg/kg | Rat<br>Guinea Pig | This compound may be carcinogenic |
| | Subcutaneous | LDLo | 7.5 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LDLo | 50 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LDLo | 7 mg/kg | Rabbit | Toxic studies not reported |
| Nitrocellulose | Ingestion | LD50 | > 5,000 mg/kg | Rat<br>Mouse | Toxic studies not reported |
| Nitroglycerin | Subcutaneous | LDLo | 400 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LD50 | 45 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 189 mg/kg | Rabbit | Toxic studies not reported |
| Nitroguanidine | Ingestion | LD50 | 3,120 mg/kg | Guinea Pig | Toxic studies not reported |
| | Dermal | LDLo | > 2,000 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LD50 | 48 mg/kg | Mouse | Toxic studies not reported |
| Potassium chlorate | Unreported | LDLo | 429 mg/kg | Human | Toxic studies not reported |
| | Ingestion | LD50 | 1,870 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LDLo | 1,500 mg/kg | Rat | Toxic studies not reported |
| Potassium nitrate | Ingestion | LD50 | 1,901 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LDLo | 100 mg/kg | Cat | Toxic studies not reported |
| Potassium sulfate | Ingestion | LD50 | 2,340 mg/kg | Rat | Toxic studies not reported |

**Table D-5. Toxicity Information for the Chemical Components of Munitions and Energetics.**

| Name | Exposure Route | Relative Toxicity | | Species | Symptoms of Toxic Dose or Concentration |
|---|---|---|---|---|---|
| n-Propylbromide | Inhalation | LC50 | 253,000 mg/m$^3$/30 minutes | Rat | Toxic studies not reported |
| | Ingestion | LDLo | 4,000 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 2,530 mg/kg | Mouse | Toxic studies not reported |
| Propylene oxide | Inhalation | TCLo<br>LC50 | 1,400,000 mg/m$^3$/10 minutes<br>4,130 mg/m$^3$/4 hours | Human<br>Mouse | Sleepiness; headache |
| | Ingestion | LD50 | 380 mg/kg | Rat | Toxic studies not reported |
| | Intraperitoneal | LD50 | 150 mg/kg | Rat | Toxic studies not reported |
| Red phosphorus | Unreported | LDLo | 4.4 mg/kg | Human | Toxic studies not reported |
| Sodium nitrate | Ingestion | TDLo<br>LD50 | 14 mg/kg<br>1,276 mg/kg | Human<br>Rat | Increased pulse rate; cyanosis, methemoglobinemia-carboxhemoglobinemia |
| | Intravenous | LD50 | 175 mg/kg | Mouse | Toxic studies not reported |
| | Intraperitoneal | LD | > 181 mg/kg | Rat | Toxic studies not reported |
| Sodium sulfate | Ingestion | LD50 | 5,989 mg/kg | Mouse | Toxic studies not reported |
| | Intravenous | LD50 | 1,220 mg/kg | Rabbit | Toxic studies not reported |
| Stearic acid | Ingestion | LDLo | 4,640 mg/kg | Rat | Toxic studies not reported |
| | Dermal | LD50 | > 5,000 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LD50 | 23 mg/kg | Rat | Toxic studies not reported |
| Sulfur | Inhalation | LC50 | 1,660 mg/m$^3$ | Mammal | Toxic studies not reported |
| | Ingestion | LDLo | 175 mg/kg | Rabbit | Toxic studies not reported |
| | Intravenous | LDLo | 5 mg/kg | Rabbit | Toxic studies not reported |
| | Intraperitoneal | LDLo | 55 mg/kg | Guinea Pig | Toxic studies not reported |
| Tin oxide | -- | This compound is an irritant as a dust. | | -- | -- |
| Titanium dioxide | Inhalation | TCLo | 10 mg/m$^3$/6 hours for 4 weeks | Rat | Chronic pulmonary edema |
| Trinitrotoluene | Ingestion | LDLo | 500 mg/kg | Cat<br>Rabbit | Toxic studies not reported |
| | Subcutaneous | LDLo | 200 mg/kg | Cat | Toxic studies not reported |
| White phosphorus | Ingestion | TDLo<br>LDLo<br>LD50 | 11 mg/kg<br>1.4 mg/kg<br>3.0 mg/kg | Human<br>Human<br>Rat | Cyanosis; hypermobility of the gastrointestinal tract; nausea; increased body temperature |
| Zinc | Inhalation | TCLo | 124 mg/m$^3$/50 minutes | Human | Cough; shortness of breath; sweating |

-- Information was not available on the Registry of Toxic Effects of Chemical Substances.
> greater than

LCLo lowest published lethal concentration
LC50 lethal concentration resulting in 50 percent mortality
LD lethal dose
LDLo lowest published lethal dose
LD50 lethal dose resulting in 50 percent mortality
mg/kg milligrams per kilogram
mg/m$^3$ milligrams per cubic meter
TCLo lowest published toxic concentration
TDLo lowest published toxic dose

SOURCE: NIOSH, 1999

# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX E*

*Solid and Hazardous Waste Management Units at DPG*

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# Solid and Hazardous Waste Management Units at DPG

Appendix E provides information about the SWMUs and HWMUs under DPG's IRP. On March 15, 1994, the Executive Secretary of the Utah Solid and Hazardous Control Board issued a RCRA permit for storage of hazardous waste at DPG. As a condition of this permit, DPG is required to perform a corrective action investigation for each SWMU identified at DPG (PES, 1996). SWMUs are generally defined as areas used to manage hazardous waste prior to 1980 and are being investigated by the COE under a RCRA facility investigation. As of 1998, 160 SWMUs have been identified at DPG; these units are summarized in Table E-1, Solid and Hazardous Waste Management Units at DPG, and are identified on Figure E-1, Locations of SWMUs at DPG.

Forty-five HWMUs are identified in Stipulation and Consent Orders 8909884 dated September 13, 1990 and amended December 22, 1993 and 9309065 dated September 30, 1994 from the UDSHW. HWMUs are generally defined as areas used to manage hazardous waste after 1980 and are being investigated under a consent order investigation. The consent orders state that the identified HWMUs must be closed and until closure, they are subject to all applicable interim status requirements. DPG plans to close the identified HWMUs; units that have not been closed to date are listed in the Final Part A Permit Application Modification for DPG Interim Status Facilities (AGEISS, 1998b). The HWMUs are summarized in Table E-1, Solid and Hazardous Waste Management Units at DPG, and are identified on Figure E-2, Locations of HWMUs at DPG.

In February 2000, DPG established a formal Restoration Advisory Board, which is comprised of approximately 20 members representing diverse community interests. The Board addresses issues pertaining to the IRP.

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**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| HWMU 2 | Scrap Construction Landfill, North Granite Peak | Landfill used to dispose a variety of solid wastes generated during range clean-up and demilitarization activities. | Central portion of DPG, north of Granite Peak | 4 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, pesticides, dioxins/furans, ABPs, metals<br>• Groundwater - explosives, metals | • Engineering controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 7 | Brine Vats, West of Granite Peak | Bermed concrete pad which previously supported 20 brine vats used for evaporation of wastewater from testing programs. | Central portion of DPG, west of Granite Peak | None | • Soil<br>• Material | • Soil - VOCs, SVOCs, ABPs, metals<br>• Material - VOCs, explosives, ABPs, metals | • Administrative controls proposed as corrective action<br>• Risk to be reevaluated when toxicity data available for ABPs<br>• Final closure plan submitted |
| HWMU 9/9A | Storage Site, 3X Scrap Material, West of Granite Peak | Storage area (9) and staging area (9A) primarily used for the aboveground storage of range debris and 3X-decontaminated material. | Central portion of DPG, west of Granite Peak | None | Soil | VOCs, SVOCs, dioxins/furans, explosives, ABPs, TPH, metals | • Engineering and administrative controls recommended as corrective action<br>• Risk to be reevaluated when toxicity data available for ABPs<br>• Final closure plan submitted |
| HWMU 14 | Disposal Site, Junction of Downwind West and Juliet Roads | Landfill used to manage a wide range of solid waste materials including range-related debris. | Central portion of DPG, southeast of Granite Peak | 4 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, explosives, metals<br>• Groundwater - metals | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 20 | Camels Back Ridge Landfill (HWMUs 20-1 and 20-2) | Suspected landfill was revealed to be cable burial mounds. | Eastern portion of DPG, at the northern end of Camels Back Ridge | None | Soil | VOCs, metals | Administratively closed |
| HWMU 27 | PCB/POL Storage Site (Buildings 9450/9542) | No information is available. | Central portion of DPG, northwest of Baker | None | No information available | No information available | No further action recommended based on pre-Consent Order field activities |
| HWMU 30 | Empty Fuel Oil Tanks at Wig Mountain | Area used to store fuel oil tanks that came from English Village residences. | Northern portion of DPG, south of Wig Mountain | None | • Soil<br>• Soil Gas | None | • No further action recommended<br>• Final closure plan submitted |
| HWMU 33 | Sewage Lagoon, North of Baker Laboratory | Engineered structure used to dispose sanitary and laboratory wastes from various facilities in Baker. | Central portion of DPG, at the north end of Baker | 4 | • Soil<br>• Groundwater<br>• Sludge/Sediment<br>• Wastewater | • Soil - SVOCs, PCBs, metals<br>• Groundwater - metals<br>• Sludge/Sediment - VOCs<br>• Wastewater - none | • Engineering and administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 34 | Boiler House Sump, East of Baker Laboratory | Sump and overflow pond and ditches used to dispose blowdown effluent from the boilers in the Baker boiler house. | Central portion of DPG, at the southeastern edge of Baker | None | • Soil<br>• Sludge/Sediment<br>• Wastewater | • Soil - VOCs, SVOCs, TPH, metals<br>• Sludge/Sediment - VOCs<br>• Wastewater - none | • Administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 36 | Imhoff Tank/Drainfield, Ditto Technical Center | HWMU served as the wastewater treatment facility for Avery, Ditto, and MAAF. | Eastern portion of DPG, west of Ditto Technical Center | 11 | • Soil<br>• Groundwater<br>• Surface Water<br>• Sludge/Sediment<br>• Wastewater<br>• Material | • Soil - VOCs, SVOCs, pesticides, PCBs, ABPs, TPH, metals<br>• Groundwater - VOCs, metals<br>• Surface Water - VOCs<br>• Sludge/Sediment, Wastewater, Material - VOCs | • Administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 37 | Landfill, West of Ditto Technical Center (Includes SWMUs 87 & 89) | Landfill was used to dispose a variety of waste types including waste from the Ditto Chemical Laboratory. | Eastern portion of DPG, southwest of Ditto Technical Center | 10 | • Soil<br>• Soil Gas<br>• Groundwater | • Soil - VOCs, SVOCs, pesticides, explosives, ABPs, TPH, metals<br>• Soil Gas - VOCs<br>• Groundwater - VOCs, cyanide, metals | • Engineering and administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 38 | Contaminated Soil, South of Ditto Technical Center | HWMU used to decontaminate agent-contaminated vehicles and to test the effectiveness of decontamination procedures. | Eastern portion of DPG, at the southwestern edge of Ditto Technical Center | 5 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, TPH, metals<br>• Groundwater - VOCs, SVOCs, metals | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 39 | Landfill, North of Avery | Landfill used to dispose miscellaneous refuse possibly including radiation waste and 3X-decontaminated material. | Eastern portion of DPG, northeast of Avery | 5 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, pesticides, TPH, metals<br>• Groundwater - metals | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| HWMU 40 | Fenced Storage Area, Avery | Surface storage area for 3X material, nickel-cadmium batteries, surplus pipe, and other miscellaneous materials. | Eastern portion of DPG, at the southeast end of Avery | None | Soil | SVOCs, pesticides, PCBs, ABPs, metals | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 42 | Contractor Landfill, English Village | Landfill used to dispose miscellaneous refuse from all DPG construction activities including refuse from the English Village paint shop. | Near the eastern boundary of DPG, southeast of English Village | 6 | • Soil<br>• Groundwater | • Soil - VOCs, pesticides, ABPs, TPH, metals<br>• Groundwater - VOCs, TPH, metals | • Engineering and administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 43 | Old Landfill at English Village | Landfill used to dispose of miscellaneous refuse from all DPG areas and was the primary landfill for English Village. | Eastern portion of DPG, south of English Village | 7 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, pesticides, TPH, metals<br>• Groundwater - TPH | • Engineering and administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 46 | Shop Sump, Maintenance Area, English Village | Two-chambered concrete tank that served as an in-ground waste oil disposal sump for the DPG Motor Vehicle Repair Shop. | Eastern portion of DPG, near the western edge of English Village | 1 | • Soil<br>• Groundwater<br>• Wastewater<br>• Sludge/Sediment<br>• Material | • Soil - SVOCs, TPH, metals<br>• Groundwater - metals<br>• Wastewater - VOCs, SVOCs<br>• Sludge/Sediment - VOCs, SVOCs<br>• Material - VOCs | • No further action recommended after waste removal<br>• Draft closure plan submitted |
| HWMU 47 | Sewage Lagoons, South of Fries Park | Two sewage lagoons that received sanitary waste from the English Village sanitary sewer system including Fries Park. | Eastern portion of DPG, south of Fries Park | 6 | • Soil<br>• Groundwater<br>• Sludge/Sediment | • Soil - SVOCs, metals<br>• Groundwater - VOCs, explosives, TOX, TOC, radiochemistry, chloride, fluoride, metals<br>• Sludge/Sediment - none | Further investigation recommended |
| HWMU 48 | 3X Storage Area, Fries Park | Storage area for 3X and a variety of other material and equipment such as DS-2 decontamination solution and unused agent samplers. | Eastern portion of DPG, near the northern edge of Fries Park | None | • Soil, Soil Gas<br>• Material | • Soil - VOCs, SVOCs, pesticides, PCBs, dioxins/furans, ABPs, metals<br>• Material - VOCs, SVOCs, ABPs<br>• Soil Gas - no results presented | • Engineering and administrative controls recommended as corrective action<br>• Final closure plan submitted |
| HWMU 51 | Evaporation Pond, Near Ditto Technical Center | Pond that received decontamination solutions from the neutralization of chemical agents used in the DTC. | Eastern portion of DPG, east of Camels Back Ridge | 8 | • Soil<br>• Groundwater<br>• Wastewater | • Soil - VOCs, pesticides, metals<br>• Groundwater - metals<br>• Wastewater - VOCs, ABPs | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 55 | 3X Disposal Site, East of Carr | Landfill used to dispose items contaminated with chemical agent and residues from chemical agent decontamination procedures. | Eastern portion of DPG, southeast of Carr | 10 | • Soil<br>• Soil Gas<br>• Groundwater | • Soil - VOCs, SVOCs, pesticides, metals<br>• Soil Gas - VOCs<br>• Groundwater - VOCs, metals | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 58 | Evaporation Pond, Carr | Pond used to dispose decontaminated waste solutions generated at various facilities including Ditto Chemical Laboratory. | Eastern portion of DPG, southeast of Carr | 15 | • Soil<br>• Groundwater<br>• Wastewater | • Soil - VOCs, chemical agent, ABPs, metals<br>• Groundwater - VOCs, ABPs, cyanide, metals<br>• Wastewater - VOCs, ABPs, TPH | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 59 | Pad 7/3X Storage Area, Carr | Area used primarily for temporary surface storage of items and waste exposed to agents that were decontaminated to 3X level. | Eastern portion of DPG, north of Carr | None | Soil | VOCs, SVOCs, pesticides, ABPs, metals | • Engineering controls recommended as corrective action<br>• Risk to be reevaluated when toxicity data available for ABPs<br>• Draft closure plan submitted |
| HWMU 63 | Contaminated Soil, Carr (Includes HWMUs 63-1 and 63-2) | Septic systems and associated leachfields that primarily receive sanitary liquid waste. | Eastern portion of DPG, in Carr | 7 | • Soil<br>• Groundwater<br>• Wastewater<br>• Sludge/Sediment | • Soil - VOCs, SVOCs, pesticides, ABPs, TPH, metals<br>• Groundwater - VOCs, metals<br>• Wastewater - VOCs, SVOCs, pesticides, ABPs<br>• Sludge/Sediment - VOCs | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 90 | Burning Area, North of Carr | Landfill used to dispose range clearance material and for burning range waste from Carr and the ranges. | Eastern portion of DPG, southeast of Carr | 6 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, dioxins/furans, ABPs, metals<br>• Groundwater - VOCs, metals | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| HWMU 99 | 3X Disposal Area, Camels Back Ridge | Former gravel borrow pit used to store range clearance materials including possible 3X material. | Eastern portion of DPG, near the eastern escarpment of Camels Back Ridge | None | Soil | VOCs, SVOCs, Cyanide, metals | • No further action recommended<br>• Draft closure plan submitted |
| HWMU 120 | Burn Facility, Building 5710, English Village | No information is available. | Eastern portion of DPG, southwest of English Village | None | No information available | No information available | No further action recommended based on pre-Consent Order field activities |
| HWMU 121 | Air Burning Incinerator at Baker | No information is available. | Central portion of DPG, in Baker | None | No information available | No information available | No further action recommended based on pre-Consent Order field activities |
| HWMU 124 | 3X/5X Incinerator, Carr | Oil-fired incinerator used to decontaminate 3X contaminated material to 5X status. | Eastern portion of DPG, in Carr | None | • Soil<br>• Material | • Soil - VOCs, pesticides, dioxins/furans, ABPs, TPH, metals<br>• Material - none | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 125 | Boiler Blowdown Sump at Avery | No information is available. | Eastern portion of DPG, in Avery | None | No information available | No information available | No further action recommended based on pre-Consent Order field activities |
| HWMU 128 | Pesticide Storage Building, English Village | Septic system and associated leachfield possibly connected to Building 5658, Pesticide Storage Building. | Eastern portion of DPG, on the southwestern boundary of English Village | 3 | • Soil<br>• Groundwater<br>• Sludge/Sediment<br>• Wastewater | • Soil - VOCs, SVOCs, pesticides, PCBs, TPH, metals<br>• Groundwater - VOCs, metals<br>• Sludge/Sediment - VOCs, SVOCs<br>• Wastewater - SVOCs | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 130 | Sump, AAFES Gas Station, English Village | Sump and drainfield that collected waste water from the English Village Gas Station service bays. | Eastern portion of DPG, in the southeastern portion of English Village | 1 | • Soil<br>• Groundwater<br>• Sludge/Sediment<br>• Wastewater | • Soil - VOCs, SVOCs, TPH, metals<br>• Groundwater -none<br>• Sludge/Sediment - VOCs, TPH<br>• Wastewater - TPH | • No further action recommended after interim removal<br>• Draft closure plan submitted |
| HWMU 158 | Evaporation Pond, North of MAAF | Pond that received wastewater from HWMU 162 during decontamination activities. | Eastern portion of DPG, at the northwestern end of the MAAF runway | 4 | • Soil<br>• Groundwater | • Soil - VOCs, PCBs, metals<br>• Groundwater - VOCs, metals | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 160 | Air Force 777 Radar Pad No. 1 Waste Management Area | Landfill used to dispose nonhazardous solid waste. | Reportedly in the central portion of DPG, northwest of Granite Peak | None | None | NA | Administratively closed due to mistaken location of alleged landfill |
| HWMU 161 | Air Force 777 Radar Pad No. 2 Fuel Storage Area | Site intended as a fuel storage area but was never used. | Central portion of DPG, north of Granite Peak | None | None | NA | Administratively closed |
| HWMU 162 | Decontamination Pad, North of Avery | Concrete decontamination pad used to decontaminate aircraft and liquid storage tanks used in agent-simulant testing. | Eastern portion of DPG, at the northwestern end of the MAAF runway | None | Soil | metals | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 163 | Fire Training Area, Avery | Fire training pit, fuel drum storage area, and fuel storage tank used to conduct fire-training exercises including use of JP4 fuel. | Eastern portion of DPG, in the northern portion of Ditto | 5 | • Soil<br>• Groundwater<br>• Soil Gas | • Soil - VOCs, SVOCs, pesticides, dioxins/furans, TPH, metals<br>• Groundwater - VOCs<br>• Soil Gas - no results presented | • Administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 164 | Avery Wash Rack No. 1 | Area used to clean uncontaminated vehicles with water. | Eastern portion of DPG, in Avery | None | Soil | VOCs, TPH, metals | Administratively closed |
| HWMU 165 | Wash Rack, Avery | Vehicle wash rack used to clean uncontaminated AF vehicles with water from the adjacent water hydrant. | Eastern portion of DPG, in the northeastern portion of Avery | None | Soil | VOCs, SVOCs, TPH, metals | • No further action recommended<br>• Final closure plan submitted |
| HWMU 166 | Avery Wash Rack No. 3 | Area used to wash railcars that contained radioactive cobalt-60. | Eastern portion of DPG, in Avery | None | Soil | VOCs, TPH, metals | Administratively closed |
| HWMU 167 | Contaminated Soil at Building 4348, Ditto Technical Center | Concrete pad, two water spigots, and two drainage ditches used to wash uncontaminated vehicles. | Eastern portion of DPG, near the southwestern boundary of Ditto | None | Soil | VOCs, SVOCs, TPH, metals | • No further action recommended<br>• Final closure plan submitted |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| HWMU 168 | Vehicle Wash Rack, Carr | A concrete pad initially used as a mix-and-transfer facility for chemical agent and simulant and later as a vehicle wash rack | Eastern portion of DPG, near the southeastern boundary of Carr | None | • Soil<br>• Material | • Soil - VOCs, SVOCs, pesticides, ABPs, TPH, metals<br>• Material - VOCs, SVOCs, ABPs | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 169 | Vehicle Wash Rack, Baker | Two concrete pads, a sump, a concrete trough, and an evaporation pond used for decontaminating vehicles used during agent tests. | Central portion of DPG, near the east side of Baker | None | • Soil<br>• Material | • Soil - VOCs, SVOCs, ABPs, metals<br>• Material - VOCs | • Engineering and administrative controls recommended as corrective action<br>• Draft closure plan submitted |
| HWMU 170 | English Village Steam Cleaning Area | Area used to clean trash barrels and dumpsters from the English Village residential area. | Eastern portion of DPG, in English Village | None | • Soil<br>• Material | • Soil - VOCs, pesticides, metals<br>• Material - VOCs | Administratively closed |
| HWMU 190 | Ranger Landfill, Primehaul Road Gravel Pit | Former gravel borrow pit used to dispose miscellaneous trash and debris generated during range-clearance activities. | Northeastern portion of DPG, on the south flank of Cedar Mountains | None | Soil | VOCs, SVOCs, pesticides, TPH, metals | • Administrative controls recommended as corrective action<br>• Final closure plan submitted |
| SWMU 1 | Scrap Construction Material Landfill from V-Grid | Landfill reportedly containing general refuse and scrap metal. | Central portion of DPG, north of Granite Peak | None | Soil | Material - metals | Further investigation recommended |
| SWMU 3 | Vehicle Decontamination Pad (Adjacent to Building T-9410), V-Grid | Decontamination area, landfill, and UST associated with testing activities on V-Grid. | Central portion of DPG, north of Granite Peak | None | • Soil<br>• Wastewater | • Soil - SVOCs, TOC, metals<br>• Wastewater - SVOCs | Further investigation recommended |
| SWMU 4 | Old Baker Laboratory, N. Granite Peak | Remnants of former biological laboratory used for testing biological agents. | Central portion of DPG, on the northern end of Granite Peak | None | Soil | SVOCs, pesticides, explosives, TOC, metals | Further investigation recommended |
| SWMU 5 | Contaminated Material Burial Site, V-Grid | Multiple trenches used to dispose vehicles, vehicle parts and miscellaneous equipment contaminated with chemical and biological agents. | Central portion of DPG, north of Granite Peak | None | • Soil<br>• Soil Gas | • Soil - VOCs, SVOCs, TOC, TPH, metals<br>• Soil Gas - none | Further investigation recommended |
| SWMU 6 | Surface Storage Area Vic 10 Mile Tower, V-Grid | Area used by the Air Force as a target area for the Maverick Missile. | Central portion of DPG, northeast of Granite Peak | None | • Soil<br>• Soil Gas | • Soil - VOCs, SVOCs, TPH, metals<br>• Soil Gas - VOCs, TPH | Further investigation recommended |
| SWMU 8 | Burial Site, West of Granite Peak | Area with waste pile of miscellaneous solid waste and unknown ordnance, possibly two trenches. | Central portion of DPG, on the northwest side of Granite Peak | None | Soil | SVOCs, dioxins, metals | No further action recommended |
| SWMU 10 | Low Level Rad Landfill, West of Granite Peak | Area used for disposal and/or testing of radioactive material, possibly including disposal of German chemical agents from World War II. | Central portion of DPG, on the west side of Granite Peak | None | Soil | ABPs, radiochemistry, metals | Further investigation recommended |
| SWMU 11 | Low Level Rad Landfill, East of Granite Peak | Trenches used to dispose beryllium-containing missile propellant wastes by burning, possible radioactive waste holding area. | Central portion of DPG, on the east side of Granite Peak | None | Soil | SVOCs, TPH, radiochemistry, metals | Further investigation recommended |
| SWMU 12 | Low Level Rad Landfill, East of Granite Peak | Area used for disposal and/or testing of radioactive material. | Central portion of DPG, on the east side of Granite Peak | None | Soil | Explosives, radiochemistry | No further action recommended |
| SWMU 13 | Decontamination Pad, Junction Downwind & Lima Roads | Area used to decontaminate vehicles contaminated with chemical agent and/or white phosphorus, possible white phosphorus storage area. | Central portion of DPG, southeast of Granite Peak (Downwind Grid) | None | Soil | Total phosphorus | No further action recommended |
| SWMU 15 | Landfill, Rising Sun Test Area | Simulated tunnel fortifications used for testing a variety of munitions and chemical agents. | Eastern portion of DPG, at the northwestern corner of Rising Sun Grid | None | None | NA | Further investigation recommended |
| SWMU 16 | Decontamination Pad, Junction Downwind & Highway 101 | Area used for the decontamination of agent-contaminated vehicles. | Eastern portion of DPG, at the southwestern corner of Tower Grid | 3 | • Soil<br>• Groundwater | • Soil - SVOCs, TPH, metals<br>• Groundwater - pesticides, metals | Further investigation recommended |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 17 | Agent Disposal Site, South Tower Grid | Area used for the demilitarization of toxic chemical munitions, includes disposal trenches of unknown use. | Eastern portion of DPG, southeast of Camels Back Ridge | 4 | • Soil<br>• Groundwater | • Soil - metals<br>• Groundwater - VOCs, pesticides, metals | Further investigation recommended |
| SWMU 18 | Disposal Site, Southeast Tower Grid | Trench used to dispose miscellaneous debris including munitions fragments and agent sampling equipment. | Eastern portion of DPG, near the center of Tower Grid | None | Soil | VOCs, SVOCs, TOC, TPH, metals | Further investigation recommended |
| SWMU 19 | Disposal Site, Northeast Tower Grid | Trench and pit containing scrap metal, miscellaneous refuse, marston matting, and a 1,000-gallon storage tank. | Eastern portion of DPG, near the center of Tower Grid | None | Soil | TPH | Further investigation recommended |
| SWMU 21 | Disposal Site, North of Camels Back Ridge | Landfill that was reportedly used to dispose chemical munitions and/or target grid samplers. | Eastern portion of DPG, north of Camels Back Ridge | 3 | • Soil<br>• Groundwater<br>• Surface Water | • Soil - SVOCs, metals<br>• Groundwater - VOCs, radiochemistry, metals<br>• Surface Water - metals | Further investigation recommended |
| SWMU 22 | Capped Impoundment, Southeast Tower Grid | Lined and capped impoundment reportedly used to dispose of BZ simulant residues. | Eastern portion of DPG, near the center of Tower Grid | None | Soil | SVOCs, metals | No further action recommended but exact location of capped impoundment uncertain |
| SWMU 23 | Waste Burial Site, Southwest Tower Grid | Trench and disturbed area used to dispose residues of waste used in the classified Trial C-990. | Eastern portion of DPG, at the southwest corner of Tower Grid | None | Soil | Metals | Further investigation recommended |
| SWMU 24 | Landfill, November Road | Area used to dispose wastes generated at a nearby test range. | Central portion of DPG, near the center of Downwind Grid | None | None | NA | • Site possibly mislocated, no further action recommended at site investigated<br>• Further investigation recommended at probable correct SWMU location |
| SWMU 25 | Disposal Area, Junction of Lima Road and Stark Road, Downwind Grid | Area reportedly consisting of several backfilled trenches used to dispose red and white phosphorus residues. | Central portion of DPG, in the northeastern portion of Downwind Grid | None | Soil | SVOCs, total phosphorus | No further action recommended |
| SWMU 26 | Landfill, Highway 101 | Area used to dispose wastes such as chemical simulants, smoke residues, and ordnance. | Central portion of DPG , along Highway 101, between Juliet and Hotel Roads | No information available | No information available | No information available | Removed from investigation |
| SWMU 28 | Surface Waste Disposal Site, Horizontal Grid | Area with waste piles used to dispose debris generated in nearby testing areas, possible biological test debris. | Central portion of DPG, northeast of Granite Peak | None | Soil | SVOCs, metals | No further action recommended |
| SWMU 29 | Surface Waste Site, X-Ray Road, All-Purpose Grid | Area with abandoned metal landing mats. | Central portion of DPG, northwest of Baker | None | None | NA | No further action recommended, metal landing mats removed |
| SWMU 31 | Waste Burial Site, North Wig Mountain | Trench and disturbed area with miscellaneous refuse such as scrap metal and wood. | Northern portion of DPG, north of Wig Mountain | None | Soil | Metals | Further investigation recommended |
| SWMU 32 | Dump Site, Southwest of Baker Laboratory | Trenches and waste pile used to dispose laboratory wastes, ash from incinerators, demilitarization materials, and construction materials. | Central portion of DPG, west of Baker | 3 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, TOC, TPH, metals<br>• Groundwater - VOCs, pesticides, TPH, radiochemistry | Further investigation recommended |
| SWMU 35 | Drainfield, North of Baker Laboratory | Old sewage drain field for Baker, including tanks and aboveground piping. | Central portion of DPG, northeast of Baker | None | Soil | TPH, metals | Further investigation recommended |
| SWMU 41 | Evaporating Pond, Avery | Pond used to dispose miscellaneous effluent including radioactive (Tantalum-182) decontamination water. | Eastern portion of DPG, southeast of Building 1006 in Avery | 3 | • Soil<br>• Groundwater | • Soil - SVOCs, TPH, metals<br>• Groundwater - VOCs, pesticides, radiochemistry, metals | Further investigation recommended |
| SWMU 44 | Old Sewage Treatment Plant, English Village | Digester, clarifier, buried piping, and two sludge-drying beds used to treat sanitary and domestic wastes from English Village. | Eastern portion of DPG, southwest of English Village | 3 | • Soil<br>• Groundwater | • Soil - VOCs, SVOCs, TPH, metals<br>• Groundwater - VOCs, SVOCs, pesticides, TPH | Further investigation recommended |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 45 | Sump, Facility Engineering Area, English Village | Historically discharged wastes from painting operations to a French drain adjacent to the shop. | Eastern portion of DPG, in English Village | No information available | No information available | No information available | Administratively closed |
| SWMU 49 | PCB Storage Hut, Fries Park | Quonset hut, designated Building 6674, used for storage of items containing PCBs. | Eastern portion of DPG, west of Fries Park | None | Soil (PCBs only) | None | • No further action recommended as a Corrective Action SWMU<br>• Future use as a storage unit for PCBs will be regulated under the Toxic Substances Control Act |
| SWMU 50 | Disposal Area, Northeast Camels Back Ridge | Trench, pit, and disturbed area used to dispose of animal carcasses and possibly munitions, refuse, and empty drums. | Eastern portion of DPG, on the northeast side of Camels Back Ridge | None | Soil (ABPs only) | None | No further action recommended |
| SWMU 52 | Waste Burial Sites, Carr | Trenches and soil mounds containing munitions, laboratory vials, drums, chemical munitions, and miscellaneous wastes. | Eastern portion of DPG, southeast of Carr | None | None | NA | Further investigation recommended |
| SWMU 53 | Waste Burial Sites, Durand Road | Trenches used to dispose chemical agents and items that contain agents, including munitions. | Eastern portion of DPG, southeast of Carr | None | Soil | None | • No further action recommended at the location evaluated<br>• True SWMU location uncertain |
| SWMU 54 | Disposal Area(s), East of Carr | Trenches used to dispose miscellaneous items including chemical agent munitions. | Eastern portion of DPG, east of Carr | None | None | NA | Further investigation recommended |
| SWMU 56 | Storage Site, East of Carr | Trenches and impact craters containing scrap iron, shell casings, and spent ordnance, chemical munitions suspected. | Eastern portion of DPG, east of Carr | None | Soil | SVOCs, ABPs, metals | Further investigation recommended |
| SWMU 57 | Landfill, East of Carr | Trenches used to dispose drums, ordnance, ordnance fragments, and glass vials, including chemical agent. | Eastern portion of DPG, east of Carr | None | Soil | SVOCs, metals | Further investigation recommended |
| SWMU 60 | Chemical Storage Area, Carr | Area used to store a variety of materials including hazardous materials and chemical agents. | Eastern portion of DPG, in Carr | None | Soil | SVOCs, TOC, metals | Further investigation recommended |
| SWMU 61 | Contaminated Soil, Carr | Landfill used to dispose HD-contaminated items and smoke rounds from laboratory and other test activities. | Eastern portion of DPG, in Carr | None | Soil | SVOCs, TOC, TPH, metals | Further investigation recommended |
| SWMU 62 | Ammo Igloos, Carr | Concrete structures used for storage of range recovery munitions. | Eastern portion of DPG, in Carr | None | None | NA | No further action recommended |
| SWMU 64 | Waste Burial Site, Southeast Tower Grid | Two disposal areas (64A and 64B) containing empty buckets of decontamination salt, an empty drum, and construction debris. | Eastern portion of DPG, near the southeastern perimeter of Tower Grid | None | Soil | SVOCs, metals | No further action recommended |
| SWMU 65 | Landfill, White Sage Flats | Area with several pits and trenches thought to be impact craters, drums, and possible UXO. | Eastern portion of DPG, southeast of Carr | None | Soil | Not reported | • Further investigation recommended<br>• Included in Area of Concern 11 (White Sage Flats) |
| SWMU 66 | Disposal Area, Near Hill 5700 | Trenches reportedly used to dispose agent residues and other hazardous wastes; possible presence of decontamination pads. | Northeastern portion of DPG, northwest of English Village | None | Soil | VOCs, SVOCs, metals | No further action recommended |
| SWMU 67 | Landfill at North Cedar Mountain | Landfill area used for sheep carcasses contaminated with chemical agent. | Northeast of DPG, in Cedar Mountains | No information available | No information available | No information available | • Removed from DPG RCRA investigation<br>• Will be investigated by COE as a FUDS |
| SWMU 68 | Old Sewage Treatment Plant, English Village Area | See SWMU 44 | | | | | Combined with SWMU 44 |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 69 | POL AST Area, English Village | Facility used for the storage and distribution of petroleum products. | Eastern portion of DPG, south of English Village | 3 | • Soil<br>• Groundwater<br>• Soil Gas<br>• Wastewater | • Soil - SVOCs, TPH, metals<br>• Groundwater - VOCs, SVOCs, TPH, metals<br>• Soil Gas - VOCs, TPH<br>• Wastewater - TPH, metals | No further action recommended as a Corrective Action SWMU; any further investigation should be performed in conjunction with provisions in DPG's Spill Prevention Control and Countermeasures Plan |
| SWMU 70 | Disturbed Area (Animal Waste Dump), English Village | Area reportedly used to dispose animal wastes and wood shavings used as bedding in animal cages. | Eastern portion of DPG, south of English Village | None | Soil | SVOCs, pesticides, TPH, metals | No further action recommended |
| SWMU 71 | Sheet Range | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 72 | Sand and Gravel Pits | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 73 | Horse Stables | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 75 | Old Fries Park Sewage Lagoon | Three-celled sewage lagoon possibly used to treat sewage from the Fries Park buildings. | Eastern portion of DPG, southwest of Fries Park | None | Soil | VOCs, SVOCs, metals | Further investigation recommended |
| SWMU 76 | Stained/Disturbed Ground, Fries Park | Area initially identified as an approximately 0.25-acre square pit in a 1953 aerial photograph; use unknown. | Eastern portion of DPG, southwest of Fries Park | None | Soil Gas | None | No further action recommended |
| SWMU 77 | Ex-asphalt Pile, Little Granite Mountain | An approximate 2-acre area containing asphalt piles and patches of tar on the surface. | Eastern portion of DPG, west of Fries Park | None | Soil | SVOCs, TPH, metals | No further action recommended |
| SWMU 79 | Landfill, East of Carr | Trenches used to dispose wastes generated during chemical testing activities. | Eastern portion of DPG, east of Carr | 3 | • Soil<br>• Groundwater | • Soil - SVOCs, probable ABPs, metals<br>• Groundwater - VOCs, pesticides, metals | Combined with SWMU 57 |
| SWMU 80 | Waste Pile, East of Carr | Trenches and soil mounds used to dispose wastes generated from chemical testing activities. | Eastern portion of DPG, east of Carr | None | Soil | SVOCs | Combined with SWMU 57 |
| SWMU 81 | Former Munitions Storage Igloo, East of Carr | Structure used to store explosive materials, materials treated by open detonation in 1980 due to proximity of English Village. | Eastern portion of DPG, west of the Five Mile Hill Area | None | Soil | Metals | No further action recommended |
| SWMU 82 | Waste Pile, East of MAAF | Waste pile(s) covering approximately 2 acres containing asphalt, metal debris, spent smoke grenades, and other miscellaneous refuse. | Eastern portion of DPG, east of the MAAF runway | None | Soil | TPH | No further action recommended |
| SWMU 83 | Rifle Range | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 84 | Borrow Trenches | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 85 | Dune Field Borrow Area | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 86 | Former Coal Piles | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 87 | Landfill Southwest of Ditto Technical Center | Trench used to dispose a variety of wastes possibly including wastes from the Chemical Laboratory. | Eastern portion of DPG, southwest of Ditto | None | Soil | SVOCs, ABPs, TOC, TPH, metals | Combined with HWMU 37 |
| SWMU 88 | Borrow Area | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 89 | Waste Pile East of Ditto Technical Center | Piles containing asphalt, soil, bricks, coal, and tar. | Eastern portion of DPG, southwest of Ditto | None | Soil | SVOCs, TPH | Combined with HWMU 37 |
| SWMU 91 | Asphalt Pile, South of Baker | Pile containing asphalt and soil; boiler residue reportedly disposed at site. | Central portion of DPG, south of Baker | None | None | NA | No further action recommended |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 92 | Landfill, Northeast of Baker | A graded/disturbed area and soil mound believed to contain waste generated from Baker. | Central portion of DPG, northeast of Baker | None | Soil | Metals | No further action recommended |
| SWMU 93 | Excavation/Trenches, Northeast of German Village | Area used for temporary storage of materials and equipment from range clean-up activities. | Central portion of DPG, in the northeastern portion of Downwind Grid | None | Soil | TPH, metals | No further action recommended |
| SWMU 94 | Borrow Pit | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 95 | Borrow Pit | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 96 | Concrete Debris, South of MAAF | Waste pile containing concrete, rubble, scrap wood and metal, and possibly F999 wastes from sewer system. | Eastern portion of DPG, south of MAAF | None | Soil | SVOCs, TOC, TPH, metals | No further action under Corrective Action Permit recommended but engineering controls recommended |
| SWMU 97 | Drainfield & Decontamination Pad, Southwest of Avery | Area used during agent decontamination activities. | Eastern portion of DPG, southeast of MAAF | None | Soil | SVOCs, TPH, metals | No further action recommended |
| SWMU 98 | Pipeline Excavation, Old Igloos, Carr | Area of soil stained with chemical agent(s) and landfill with buried munitions, stained soil, and other debris. | Eastern portion of DPG, near the northeast corner of Carr | None | None | NA | Further investigation recommended |
| SWMU 100 | Groundwater Aquifer | No information is available. | No information available | No information available | No information available | No information available | Determined not to be a SWMU during the RCRA Facility Assessment |
| SWMU 101 | Waste Disposal Site, East of Wig Grid | Area used to dispose metal debris and empty fuel-oil drums. | Northern portion of DPG, east of Wig Mountain | None | Soil | SVOCs, TPH, metals | No further action recommended |
| SWMU 103 | Decontamination Pad at Building 9411, West of Granite Peak | Area used for decontamination of agent-contaminated equipment. | Central portion of DPG, on the northwest side of Granite Peak | None | Soil | SVOCs | No further action recommended |
| SWMU 104 | Decontamination Pad at Junction of Tango, Burns, and Victory Roads | Area used to decontaminate vehicles contaminated with biological agent. | Central portion of DPG, west of Baker | None | Soil | SVOCs, metals | No further action recommended |
| SWMU 105 | Landfill, West of Carr | Trench containing miscellaneous debris and spent ordnance, possible agent-contaminated materials from testing programs. | Eastern portion of DPG, southwest of Carr | None | Soil | VOCs, SVOCs, metals | Combined with SWMU 180 for further investigation |
| SWMU 106 | Landfill, East of Carr | Trench, demolition pit, and burn area with drums, spent munitions, and scrap metal. | Eastern portion of DPG, east of Carr | None | Soil | SVOCs, TPH, metals | Combined with SWMU 57 for further investigation |
| SWMU 107 | Decontamination Pad, Tower Grid | Area used to decontaminate agent-contaminated vehicles. | Eastern portion of DPG, near the center of Tower Grid | None | Soil | Metals | No further action recommended |
| SWMU 108 | BE & C-14 Waste Disposal Area, Southeast of Granite Peak (Formerly Known As "Radioactive Waste Landfill") | Area used for disposal and/or testing of radioactive material. | Central portion of DPG, on the southeast side of Granite Peak | None | None | NA | No further action recommended |
| SWMU 109 | BE & C-14 Waste Disposal Area, South of Granite Peak (Formerly Known As "Radioactive Waste Landfill") | Area used for disposal and/or testing of radioactive material. | Central portion of DPG, on the south side of Granite Peak | None | None | NA | No further action recommended |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 110 | BE & C-14 Waste Disposal Area, South of Granite Peak (Formerly Known As "Radioactive Waste Landfill") | Area used for disposal and/or testing of radioactive material. | Central portion of DPG, on the south side of Granite Peak | None | Soil | Radiochemistry, metals | No further action recommended |
| SWMU 111 | BE & C-14 Waste Disposal Area, Southwest of Granite Peak (Formerly Known as "Radioactive Waste Landfill") | Area used for disposal and/or testing of radioactive material. | Central portion of DPG, on the west side of Granite Peak | None | Soil | SVOCs, radiochemistry | No further action recommended |
| SWMU 113 | Landfill, Pole Line Road | Former debris piles containing drums, spent ordnance, and miscellaneous refuse; possibly several trenches. | Eastern portion of DPG, southwest of Carr | None | Soil | SVOCs, TPH, metals | Further investigation recommended |
| SWMU 114 | Old GPI-3 Test Site, Northwest V-Grid (Includes SWMU 202) | Area with biological test laboratory and waste piles containing miscellaneous scrap wood and metal. | Central portion of DPG, northeast of Granite Peak | None | • Surface Water<br>• Material | • Surface Water - none<br>• Material - SVOCs, asbestos | Further investigation recommended |
| SWMU 115 | Landfill, X-Ray Road, 1 Mile South of Building T-9490 | Area used to dispose miscellaneous debris including projectile containers, ordnance scrap, and possibly propellants and agent-contaminated items. | Central portion of DPG, east of Baker | None | Soil | SVOCs, TPH, metals | Further investigation recommended |
| SWMU 116 | Landfill, Nye Road, Southwest of Ditto Technical Center | Area used to disposal wastes from the former maintenance shop including wire, pipe, batteries, and possibly P999 wastes. | Eastern portion of DPG, southwest of Ditto | None | Soil | TPH, metals | Further investigation recommended |
| SWMU 117 | Waste Disposal Pit, Falconer Road, All Purpose Grid | Area with trench used as a revetment and staging area for equipment and personnel during tests at SWMU 118. | Central portion of DPG, northeast of Granite Peak | None | Soil | SVOCs, TOC, metals | No further action recommended |
| SWMU 118 | Test Vat (1940s-1950s), East of V-Grid | Vat used for testing flares, munitions, and other tests using chemical agents. | Central portion of DPG, northeast of Granite Peak | None | Soil | SVOCs, explosives, ABPs, metals | Further investigation recommended |
| SWMU 122 | Incinerator, Baker Laboratory Basement | Incinerator used to destroy pathological waste. | Central portion of DPG, in Baker | None | Material (ash) | SVOCs, metals | No further action recommended |
| SWMU 123 | Incinerator, Baker Laboratory Building 2028 | Incinerator used to destroy deactivated T-2 toxin, benzene, medical wastes, paper, and laboratory animals. | Central portion of DPG, in Baker | None | Soil | Metals | No further action recommended |
| SWMU 126 | Yellow Jacket Near South Boundary of DPG | Area used for hazardous waste and ordnance potentially contaminated with chemical agent. | South of DPG, in the Yellow Jacket Area | No information available | No information available | No information available | • Removed from DPG RCRA investigation.<br>• Will be investigated by COE as a FUDS |
| SWMU 127 | Southern Triangle Area at the Rising Sun Test Area | Tunnels and caves, also known as SWMU 15, used for testing chemical agent. | South of DPG, in the Southern Triangle Area | No information available | No information available | No information available | • Removed from DPG RCRA investigation<br>• Will be investigated by COE as a FUDS |
| SWMU 131 | 90-Day Holding Area | Hazardous waste holding area designated Building 5478, used for storage of paint waste. | Eastern portion of DPG, near the southwestern boundary of English Village | None | None | NA | No further action recommended |
| SWMU 132 | 90-Day Holding Area | Hazardous waste holding area designated Building 5472, used for storage of motor vehicle waste. | Eastern portion of DPG, near the southwestern boundary of English Village | None | None | NA | No further action recommended |
| SWMU 133 | 90-Day Holding Area | Hazardous waste storage area designated Building 4045, used for storage of spent MEK, Stoddard solvent, and oil. | Eastern portion of DPG, in Ditto | None | None | NA | No further action recommended |
| SWMU 134 | 90-Day Holding Area | Hazardous waste storage area designated Building 1022, used for storage of decontamination solutions and solid 3X material. | Eastern portion of DPG, in Ditto | None | None | NA | No further action recommended |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 135 | 90-Day Holding Area | Hazardous waste storage area designated Building 4251, used for storage of photo developer, spent solvents, batteries, and sodium persulfate. | Eastern portion of DPG, in Ditto | None | • Soil<br>• Soil Gas | • Soil - TPH, metals<br>• Soil Gas - VOCs | No further action recommended |
| SWMU 136 | 90-Day Holding Area | Hazardous waste storage area designated Building 4236, used for storage of test-generated wastes. | Eastern portion of DPG, in Ditto | None | None | NA | No further action recommended |
| SWMU 137 | 90-Day Holding Area | Hazardous waste storage area designated Buildings 4311 and 4312, used for storage of spent methyl alcohol, tetrachlorethylene, formaldehyde, and rinse solutions. | Eastern portion of DPG, in Ditto | None | Soil | SVOCs, TPH | No further action recommended |
| SWMU 138 | 90-Day Holding Area | Hazardous waste storage area designated Building 1001, used for storage of oil, antifreeze, and battery acid. | Eastern portion of DPG, in Avery | None | None | NA | No further action recommended |
| SWMU 139 | 90-Day Holding Area | Hazardous waste storage area designated Building 1022, used for storage of used motor oil before recycling. | Eastern portion of DPG, in Avery | None | None | NA | No further action recommended |
| SWMU 140 | 90-Day Holding Area | Hazardous waste storage area designated Building 1042, used for storage of lead acid batteries and potassium hydroxide solution. | Eastern portion of DPG, in Avery | None | None | NA | No further action recommended |
| SWMU 141 | 90-Day Holding Area | Hazardous waste storage area designated Building 3045, used for storage of used oils, minor amounts of solvents, and F999 wastes. | Eastern portion of DPG, in Carr | None | None | NA | No further action recommended |
| SWMU 142 | 90-Day Holding Area | Hazardous waste storage area designated Building 3156, rarely used. | Eastern portion of DPG, in Carr | None | None | NA | No further action recommended |
| SWMU 143 | 90-Day Holding Area | Structures used to store containerized hazardous waste including decontamination solutions and solid 3X materials. | Eastern portion of DPG, in Carr | None | • Soil<br>• Soil Gas | • Soil - SVOCs<br>• Soil Gas - VOCs, TPH | • No further action recommended,<br>• Area is being investigated as SWMU 60 |
| SWMU 144 | 90-Day Holding Area | Hazardous waste accumulation site designated Building 2031, used for storage of waste including laboratory solvents and chemicals. | Central portion of DPG, in Baker | None | None | NA | No further action recommended |
| SWMU 145 | 90-Day Holding Area | Hazardous waste accumulation site designated Building 5801, used for storage of nonregulated waste motor oil and antifreeze. | Eastern portion of DPG, near the southwestern boundary of English Village | None | None | NA | No further action recommended |
| SWMU 150 | Stainless Steel Holding Tank, Carr | Tank used as part of a decontamination system in Building 3445, Toxic Agent Transfer Building. | Eastern portion of DPG, in Carr | None | None | NA | Further investigation recommended as part of the entire liquid drainage system extending from Building #3445 to the inactive evaporation pond (HWMU 58) |
| SWMU 151 | Stainless Steel Sump, Carr | Sump used as part of a decontamination system in Building 3445, Toxic Agent Transfer Building. | Eastern portion of DPG, in Carr | None | None | NA | • Removed from the RFI<br>• DPG to submit a separate closure plan when SWMU no longer in use |
| SWMU 152 | Stainless Steel Holding Tank, Carr | Tank used as part of a decontamination system in Building 3445, Toxic Agent Transfer Building. | Eastern portion of DPG, in Carr | None | None | NA | Further investigation recommended as part of the entire liquid drainage system extending from Building #3445 to the inactive evaporation pond (HWMU 58) |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 153 | Stainless Steel Sump, Carr | Sump used as part of a decontamination system in Building 3445, Toxic Agent Transfer Building. | Eastern portion of DPG, in Carr | None | None | NA | • Removed from the RFI<br>• DPG to submit a separate closure plan when SWMU no longer in use |
| SWMU 154 | Scrubber Tank, DTC, Carr | Scrubber tank used as part of the decontamination system in the DTC. | Eastern portion of DPG, at the DTC | None | None | NA | Further investigation recommended as part of the entire liquid drainage system extending from the DTC to the inactive evaporation pond (HWMU 51) |
| SWMU 155 | Waste Tank, DTC, Carr | Waste tank used as part of the decontamination system in the DTC. | Eastern portion of DPG, at the DTC | None | None | NA | Further investigation recommended as part of the entire liquid drainage system extending from the DTC to the inactive evaporation pond (HWMU 51) |
| SWMU 156 | AST, DTC, Carr | Storage tank used as part of the decontamination system in the DTC. | Eastern portion of DPG, at the DTC | None | None | NA | Further investigation recommended as part of the entire liquid drainage system extending from the DTC to the inactive evaporation pond (HWMU 51) |
| SWMU 157 | Sump, DTC, Carr | Sump used as part of the decontamination system in the DTC. | Eastern portion of DPG, at the DTC | None | None | NA | Further investigation recommended as part of the entire liquid drainage system extending from the DTC to the inactive evaporation pond (HWMU 51) |
| SWMU 159 | Incinerator, English Village | Incinerator reportedly used for disposal of nonpathogenic animal carcasses and other wastes. | Eastern portion of DPG, southwest of English Village | None | Soil | Metals | No further action recommended |
| SWMU 171 | BZ Contaminant, Building 2006, Baker | Building used for decontamination of vehicles and field equipment, designed to contain all decontamination fluids. | Central portion of DPG, in Baker | None | Sludge/Sediment | VOCs, SVOCs, TOC, metals | Further investigation recommended |
| SWMU 172 | Old Battery Shop, Building 1006, Avery | Area used for processing or recharging nickel and cadmium batteries including discharge of wastes onto the ground. | Eastern portion of DPG, in Avery | None | Soil | SVOCs, TOC, TPH, metals | Risk assessment recommended |
| SWMU 173 | Old Battery Shop, Ditto Technical Center | Buildings and associated features used for servicing and charging lead acid batteries. | Eastern portion of DPG, in Ditto | None | Soil | VOCs, SVOCs, pesticides, TOC, metals | Further investigation recommended |
| SWMU 174 | Storage Sheds, Baker | Four munitions igloos used for storing small amounts of radioactive materials mixed in solvents. | Central portion of DPG, northwest of Baker | None | None | NA | • No further action recommended<br>• Closure plan approved by the Utah Department of Environmental Quality |
| SWMU 175 | Acid Neutralization Tank, Avery | AST used for acid neutralization of photographic processing wastes, includes heating oil USTs. | Eastern portion of DPG, northwest of Building 1010 in Avery | None | Soil | SVOCs, TPH, metals | Further investigation recommended |
| SWMU 176 | Acid Dilution Box, Building 4026, Ditto Technical Center | Sump that received waste from Avery Fire Station's acid sink drain. | Eastern portion of DPG, at Avery Fire Station, Building 4026 | None | • Soil<br>• Wastewater | • Soil - TPH, metals<br>• Wastewater - VOCs, SVOCs, TPH | No further action recommended |
| SWMU 177 | Old Dry Cleaning Shop, Building 4229, Ditto Technical Center | Building used for cleaning non-rubberized protective clothing worn during field tests and in laboratories. | Eastern portion of DPG, in Ditto | None | • Soil<br>• Soil Gas | • Soil - VOCs<br>• Soil Gas - VOCs | Further investigation recommended |
| SWMU 178 | Photo Processing, Building 4258, Ditto Technical Center | Building used for photo-processing operations. | Eastern portion of DPG, in Ditto | None | • Soil<br>• Soil Gas | • Soil - VOCs<br>• Soil Gas - SVOCs, metals | No further action recommended |
| SWMU 179 | Sumps, Buildings 3342 & 3048, Carr | Sumps used to contain wastewater and sewage; may have contained oils and solvents from artillery maintenance. | Eastern portion of DPG, in Carr | None | Soil | None | Further investigation recommended (possible underground storage tanks, status of sumps to be verified) |
| SWMU 180 | Old Biological Laboratory, West of Carr | Abandoned laboratory complex used for biological testing, self-contained sewer system terminated at nearby drain field. | Eastern portion of DPG, southwest of Carr | None | • Soil<br>• Soil Gas<br>• Sludge/Sediment | • Soil - VOCs, SVOCs, pesticides, TPH, metals<br>• Soil Gas - none<br>• Sludge/Sediment - TPH | Further investigation recommended in combination with SWMU 105 |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 181 | X-Ray Laboratory, Building 3131, Carr | Laboratory that generates X-ray film processing wastes, wastewater formerly discharged to sewer. | Eastern portion of DPG, in Carr | None | Soil | SVOCs, metals | No further action recommended |
| SWMU 182 | Open Detonation Unit, Suppressive Test Shield | Steel building on a concrete pad used for detonating outdated or unwanted explosive material. | Eastern portion of DPG, near the northwest end of Camels Back Ridge | None | Soil | Metals | No further action recommended |
| SWMU 183 | B-29 Aircraft, West of Granite Peak | Partially buried B-29 aircraft reportedly used during agent testing, includes decomposed drums. | Central portion of DPG, west of Granite Peak | None | Soil | SVOCs, metals | Further investigation recommended |
| SWMU 184 | Air Filter System, Building 1004, Avery | Building used to filter exhaust air from the radiological testing facility (Operations building). | Eastern portion of DPG, in Avery | None | None | NA | Further investigation recommended as part of SWMU 41 |
| SWMU 185 | Old Chemical Laboratory, Buildings 4165 & 4153, Ditto | Buildings used as chemical laboratory and storage area used to conduct chemical agent tests. | Eastern portion of DPG, in Avery | None | None | NA | Further investigation recommended |
| SWMU 186 | New Chemical Laboratory, Ditto Technical Center | Building used as chemical laboratory; former uses include satellite drum storage area, fuel USTs, and an animal holding building. | Eastern portion of DPG, in Ditto | None | Soil | Metals | No further action recommended |
| SWMU 187 | Print Shop, Building 5466, English Village | Inactive print shop with a 5000-gallon heating oil UST, building currently used as a warehouse and office space. | Eastern portion of DPG, in the southwestern portion of English Village | None | • Soil<br>• Soil Gas | • Soil - SVOCs, metals<br>• Soil Gas - VOCs | No further action recommended |
| SWMU 188 | Waste Pit, North of Rising Sun Grid | Pit and burn area with brick, scrap wood and metal, batteries, possible ordnance fragments, and other debris. | Eastern portion of DPG, in the southwest corner of Tower Grid | None | Soil | SVOCs, TOC, metals | Further investigation recommended |
| SWMU 189 | Waste Pit, North of Rising Sun Grid | Pit with empty drums, canvas tarps, concrete debris, and scrap wood and metal. | Eastern portion of DPG, in the southwest corner of Tower Grid | None | Soil | VOCs, SVOCs, ABPs, TPH, metals | Further investigation recommended |
| SWMU 191 | Landfill, West of Existing Landfill | A dirt mound surrounded by disturbed ground, possibly a former pistol range. | Eastern portion of DPG, west of Fries Park | None | Soil | SVOCs | No further action recommended |
| SWMU 192 | Landfill, 63 Pits, West of Granite Peak | Storage site for toxic residue from open-air testing activities and burn pits used in the demilitarization of M55 rockets. | Central portion of DPG, on the northwest side of Granite Peak | None | None | NA | Further investigation recommended after additional information is obtained on the demilitarization and previous site clean-up operations |
| SWMU 193 | Decontamination pad, West of Granite Peak | Decontamination pad of unknown use. | Central portion of DPG, northwest of Granite Peak | None | Soil | SVOCs, metals | Further investigation recommended |
| SWMU 194 | Landfill, East of Carr | Three separate disposal areas (A, B, and C) that may have been used for the burial of chemical munitions. | Eastern portion of DPG, east of Carr | None | None | NA | Further investigation recommended |
| SWMU 195 | Incinerator, East of Carr | Abandoned incinerator apparently used for disposing chemical munitions fuses. | Eastern portion of DPG, east of Carr | None | Soil | SVOCs, metals | No further action recommended |
| SWMU 196 | Incinerator, East of Carr | Abandoned incinerator apparently used for disposing chemical munitions fuses. | Eastern portion of DPG, east of Carr | None | Soil | SVOCs, metals | No further action recommended |
| SWMU 197 | Landfill, Old Target Site, Downwind Grid | Trench and pad of marston matting of unknown use, general area used for conventional and chemical agent testing. | Central portion of DPG, southeast of Granite Peak (Downwind Grid) | None | Soil | SVOCs, metals | Further investigation recommended |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 199 | Old OB/OD East of SWMU 17, Tower Grid | OB/OD site for munitions and a base of operations for demilitarization activities at SWMU 17. | Eastern portion of DPG, south of the center of Tower Grid | None | • Soil<br>• Surface Water | • Soil - explosives, metals<br>• Surface Water - explosives, TOC, metals | Further investigation recommended |
| SWMU 200 | Landfill, Southeast of Carr | Trenches and soil mounds with drums above and below the surface and miscellaneous debris visible including rusted munitions. | Eastern portion of DPG, southeast of Carr | None | None | NA | Further investigation recommended |
| SWMU 201 | Camels Back Cave | Cave used to study the effects of chemical weapons systems on tunnel fortifications. | Eastern portion of DPG, on the northwest side of Camels Back Ridge | None | Soil | SVOCs, explosives, ABPs, TOC, metals | Further investigation recommended |
| SWMU 202 | Grid (Included in SWMU 114) | See SWMU 114 | | | | | Combined with SWMU 114 |
| SWMU 203 | Landfill, North of All Purpose Grid | No information is available. | No information available | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 204 | Lewisite Area, Simpson Buttes | Area used for demilitarization of mortar chemical rounds reportedly to have contained Lewisite. Includes pile of rusting chlorinated line buckets. | Southeastern portion of DPG, on the southwest corner of Simpson Buttes | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 205 | Grassy Plots Grid, East of Baker | Surface disposal site for leftover test material from the grassy plots test grid; includes drums, scrap wood, glass jugs, and partially burned material. | Central portion of DPG, west of Baker | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 206 | Surface Disposal Area, Northwest of MAAF | Surface disposal area with miscellaneous debris including M468 bomb shipping dispensers, an aircraft fuselage, drums, and ash residues. | Eastern portion of DPG, northwest of MAAF | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 207 | Disposal Trenches and Mounds, Carr | Trenches and mounds with miscellaneous debris including suspected UXO and chemical agents. | Eastern portion of DPG, west of Carr | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 208 | Drum Burial Site, Southeast of Carr | Area with partially exposed drums suspected to contain chemical agent. | Eastern portion of DPG, near Carr | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 209 | Biological Test Plots, Baker | Area used for biological tests although the types of materials used at the site are unknown. | Central portion of DPG, east of Baker | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 210 | Glass Disposal Site, South of Baker | Surface disposal area with broken and melted glassware from either Baker or field tests in the area. | Central portion of DPG, south of Baker | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 211 | Coral Pit Landfill, North of Camels Back Ridge | Surface disposal area with miscellaneous debris from test range clean-up operations including smoke and incendiary rounds and discarded sampling devices. | Eastern portion of DPG, on the north side of Camels Back Ridge | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 212 | M55 Rocket Test Site, South of Tower Grid | Area used for disposal of explosive ordnance including visible M55 chemical-agent rocket parts. | Eastern portion of DPG, west of Camels Back Ridge | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 213 | Burial Trench, Target South | Area with trench and scattered metal debris on surface consisting of rocket parts. | Central portion of DPG, southwest of Baker | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 214 | Decontamination Pad, Target South | Wash rack for decontaminating vehicles and personnel used for activities at Old Target South. | Central portion of DPG, southwest of Baker | None | None | NA | Will be investigated during Phase II of the RFI |

**Table E-1. Solid and Hazardous Waste Management Units at DPG.**

| Number | Name* | Description** | General Location | Monitoring Wells | Sample Collection | Analyte Groups Detected*** | Status |
|---|---|---|---|---|---|---|---|
| SWMU 215 | Pigeon Loft Trenches, Downwind Grid | Area with trenches and surface debris by the remnants of the former pigeon loft which housed pigeons used in test operations. | Central portion of DPG, east of Granite Peak | None | None | NA | Will be investigated during Phase II of the RFI |
| SWMU 216 | Trash Pit, Northwest of Granite Peak | Pit that contains a table, chair, tub/container, and broken glass and metal debris. | Central portion of DPG, northwest of Granite Peak | None | None | NA | Will be investigated during Phase II of the RFI |

* HWMU names are taken from the Final Part A Permit Application Modification for DPG Interim Status Facilities (AGEISS, 1998c). SWMU names are taken from the Final Hazardous Waste Permit DPG, Module IV, Tables 1 and 2 (UDSHW, 1998a).
** FWEC (1996) is the source of information for the HWMUs and Parsons Engineering Science (1996) is the source of information for the SWMUs unless otherwise referenced.
*** Organic analyte groups are listed if an analyte was detected above its certified reporting limit or recommended reporting limit. Inorganic analyte groups are listed if an analyte was detected above its background value.

| | |
|---|---|
| AAFES | Army and Air Force Exchange System |
| ABP | agent breakdown product |
| AF | Air Force |
| AST | above ground storage tank |
| BZ | 2-quinuclidinyl benzilate |
| COE | U.S. Army Corps of Engineers |
| DPG | U.S. Army Dugway Proving Ground |
| DTC | Defensive Test Chamber |
| FUDS | Formerly Used Defense Sites |
| GPI | Granite Peak Installation |
| HD | bis(2-chloroethyl) sulfide (or Distilled Mustard) |
| HWMU | hazardous waste management unit |
| MAAF | Michael Army Airfield |
| MEK | methyl ethyl ketone |
| NA | not applicable |
| No. | number |
| OB/OD | Open Burn/Open Detonation |
| PCB | polychlorinated biphenyl |
| POL | Petroleum, Oil and Lubricant |
| RCRA | Resource Conservation and Recovery Act |
| RFA | RCRA Facility Assessment |
| RFI | RCRA Facility Investigation |
| SVOC | semi-volatile organic compound |
| SWMU | solid waste management unit |
| TPH | total petroleum hydrocarbons |
| TOX | total organic halogens |
| TOC | total organic carbon |
| UST | underground storage tank |
| UXO | unexploded ordnance |
| VOC | volatile organic compound |

SOURCES: USHWCB, 1992; AGEISS, 1998b; Ebasco, 1990; AGEISS, 1998e; DPG, 1997b; Engineering Technologies, 1994; FWEC, 1997a & b

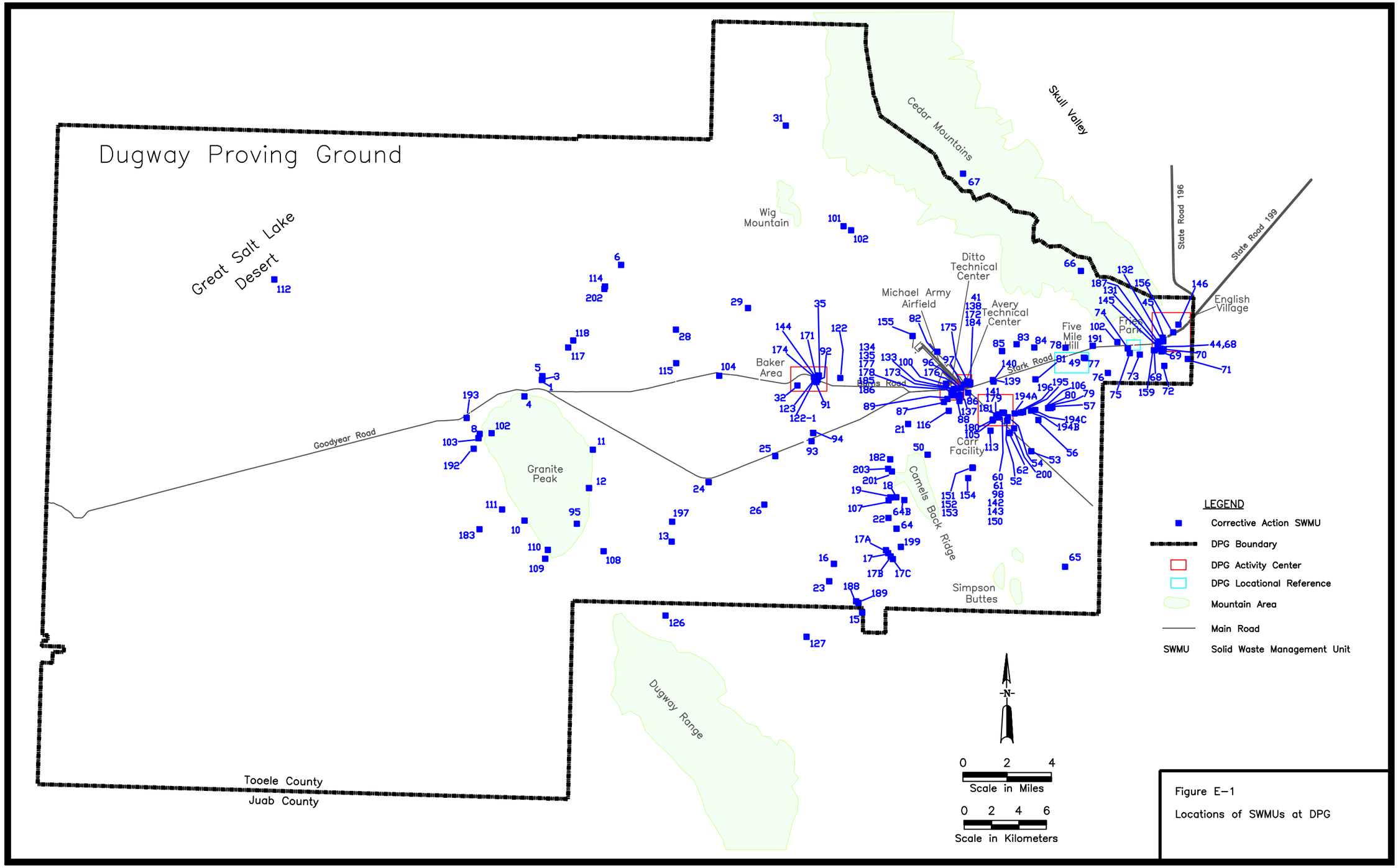


Figure E–1
Locations of SWMUs at DPG

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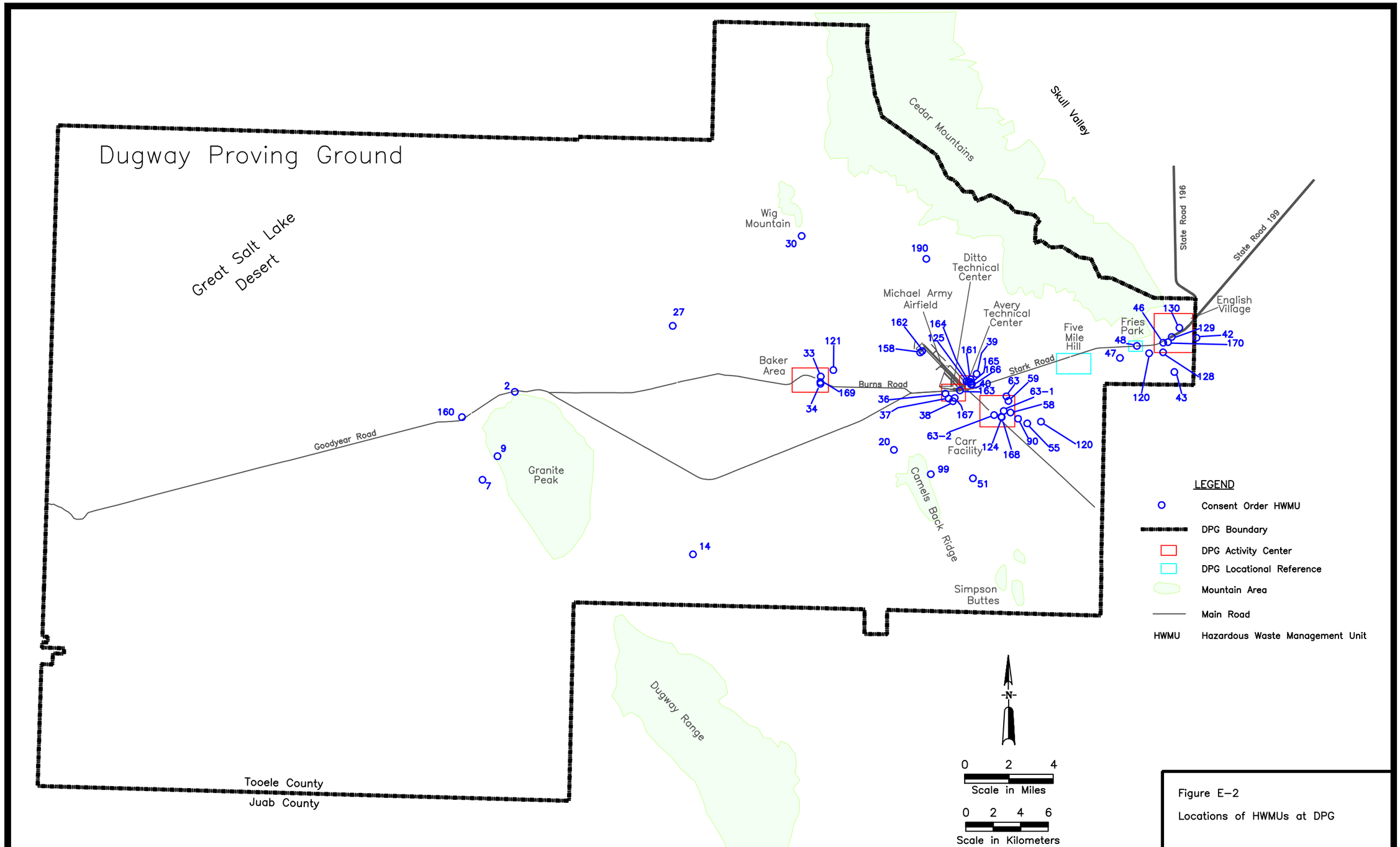


Figure E–2

Locations of HWMUs at DPG

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX F*

*Areas of Concern at DPG*

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# Areas of Concern at DPG

Appendix F contains information about areas of concern at DPG in Table F-1, Areas of Concern at DPG. The locations of these areas are shown in Figure F-1, Areas of Concern at DPG.

The RCRA Facility Assessment (USHWCB, 1992) identified 21 areas of concern at DPG that include many of the target areas, test areas, and grids shown on Figures 3.1-7 through 3.1-10. An area of concern is defined as an area with a potential release that does not fit within the definition of a SWMU. Presently, these active sites have not been investigated. However, DPG's RCRA permit directs that if any Area of Concern becomes permanently inactive, it will undergo investigation.

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**Table F-1. Areas of Concern at DPG.**

| Number | Name | Description | General Location |
|---|---|---|---|
| AOC - 1 | Test Range Area | • Includes the Ballistic Grid, Romeo and Juliet Ranges, and German Village, used from 1951 to 1968 for dissemination, ballistic firings, ballistic drops, and engineering development testing of 155-mm rockets and 4.2-inch, 105-mm, 155-mm, and 8-inch shells filled with chemical agents.<br>• BZ and CS munitions from cluster bombs were released in this area.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Central portion of DPG, east and southeast of Granite Peak |
| AOC - 2 | Test Range | Known as the Rising Sun Area, classified as a Solid Waste Management Unit (numbers 15 & 127). | Eastern portion of DPG, at the southern DPG boundary and Southern Triangle Area |
| AOC - 3 | Test Range Area | • Known as the Granite Peak Impact Area, used as a high explosive/chemical agent munitions impact area. Extensive firings of artillery projectiles, mortars, and rockets were conducted during the 1950s to early 1960s when over 10,000 rounds were fired into the area during stockpile reliability tests.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Central portion of DPG, southwest of Granite Peak |
| AOC - 4 | Test Range Area | • Known as the All Purpose Grid Facility, used since the 1940s as a test area for chemical-filled/explosive-loaded munitions, including 1,000-pound cluster bombs.<br>• Approximately 500 test operations have been conducted in this area.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Central portion of DPG, northeast of Granite Peak |
| AOC - 5 | Test Range Area | • Known as the CBR Target Area, used in firing demonstrations involving 155-mm chemical agent-filled rounds and M55 rockets. Approximately 6,500 rounds were fired as part of the CBR Weapons Orientation Course conducted from 1959 through 1969.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Northeastern portion of DPG, southwest of the Cedar Mountains |
| AOC - 6 | Test Area | • Known as the Chemical Corps Board Area.<br>• Used in trials conducted for the U.S. Army Chemical Corps Board to test the effectiveness of chemical munitions against, and protection afforded by, fortification complexes such as bunkers and foxholes. Approximately 200 chemical agent-filled landmines, projectiles, and dissemination devices were tested during the 1950s and 1960s.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Northeastern portion of DPG, southwest of the Cedar Mountains |
| AOC - 7 | Test Area | • Known as the North Wig Grid.<br>• Used for single-chemical munitions, multiple-point source chemical munitions, and low-performance line surface aerial release agents.<br>• Also used to test 5"/38, 5"/54, and 6"/47 Navy projectiles. Approximately 500 test missions were conducted from 1950 to 1960.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Northeastern portion of DPG, southwest of the Cedar Mountains |
| AOC - 8 | Test Area | • Known as the V grid.<br>• Consists of several grids superimposed over one another, and was the principal area for tests of the persistent chemical agent VX. Tests with artillery projectiles, landmines, test vehicles, spray systems, drone rockets, and other dissemination devices were conducted during the 1950s and 1960s. Approximately 1,000 field test programs were conducted during this time.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Central portion of DPG, north of Granite Peak |

**Table F-1. Areas of Concern at DPG.** **(Continued)**

| Number | Name | Description | General Location |
|---|---|---|---|
| AOC - 9 | Test Area | • Known as Target X Area.<br>• Used as an impact area. Reportedly, 8-inch mustard-filled projectiles were tested from 1954 to 1955. Approximately 500 projectiles, rockets, and explosive devices have been removed.<br>• Subsurface UXO contamination is suspected. | Central portion of DPG, west of Granite Peak |
| AOC - 10 | Test Area | • Known as the Wig Mountain Impact area for Conventional (High Explosive) Artillery Projectiles. A total of 2,500 rounds were fired into this area from the early 1960s to the late 1970s. During DPG training exercises, unknown quantities of chemical simulants/explosive-loaded M61 rounds were impacted in this area from 1959 to 1969.<br>• Unknown numbers of subsurface UXO may be scattered throughout the area.<br>• No surface UXO reported. | Northeastern portion of DPG, southwest of the Cedar Mountains |
| AOC - 11 | Test Area | • Known as the White Sage Flats, used as an impact area for conventional high explosive and illuminating artillery projectiles. Approximately 300,000 rounds were fired from 1970 to 1975. From the early 1940s to the early 1950s, area was used for testing large bombs and explosives, specific types are unknown.<br>• National Guard firing exercises are conducted here. | Southeastern portion of DPG, south of English Village |
| AOC - 12 | Test Area | • Known as the West Granite Peak Firing Range, used as a terminal point for high explosive and simulant-filled munitions in connection with the binary program. In the 1950s, this area was used for surveillance firing of chemical munitions stockpile.<br>• Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Western portion of DPG, west of Granite Peak |
| AOC - 13 | Test Area | • Known as the Tower Grid area, used to determine munitions efficiency and area coverage of artillery shells, bomblets, landmines, and test devices disseminating chemical agents and simulants.<br>• Unknown quantities of chemical agents GB and H have been tested in the area. | Eastern portion of DPG, south of Carr |
| AOC - 14 | Test Area | • Known as Hill 5700, used in the 1950s for testing munitions and subsequent effectiveness against Hill Top Fortification Complex. Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Eastern portion of DPG, north of English Village |
| AOC - 15 | Test Area | • Test area used during World War II for testing chemical mustard and incendiary munitions. Approximately 5,000 rounds were fired. Surface UXO was cleared, but there is potential explosive and chemical agent hazard from subsurface UXO. | Eastern portion of DPG, west of English Village |
| AOC - 16 | Test Area | • Known as the Mortar Range, used as a high explosive and illuminating impact area.<br>• Used in the 1940s as a chemical munitions impact area.<br>• Mortar projectiles were fired during the late 1950s and 1960s.<br>• Many mortar bodies exist on the ground surface. | Southeastern portion of DPG, south of English Village |

**Table F-1. Areas of Concern at DPG.**

| Number | Name | Description | General Location |
|---|---|---|---|
| AOC - 17 | Biological Agents Test Areas 20-24 | Areas used in biological weapons testing. | Various |
| AOC - 18 | Avery Area | Wastes may have been disposed in unknown locations. | Eastern portion of DPG in Avery |
| AOC - 19 | Baker Area | Wastes may have been disposed in unknown locations. | Central portion of DPG in Baker |
| AOC - 20 | Carr Facility | Wastes may have been disposed in unknown locations. | Eastern portion of DPG in Carr |
| AOC - 21 | Ditto Area | Wastes may have been disposed in unknown locations. | Eastern portion of DPG in Ditto |

AOC area of concern
Avery Avery Technical Center
Baker Baker Area
BZ 2-quinuclidinyl benzilate
Carr Carr Facility
CBR Chemical Biological-Radiological
CS o-chlorobenzylidene malonitrile, also popularly known as “tear gas”
Ditto Ditto Technical Center
DPG U.S. Army Dugway Proving Ground
GB isopropyl methylphosphonofluoridate
H Levinstein Mustard
mm millimeter
UXO unexploded ordnance
VX O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothioate

SOURCE: USHWCB, 1992

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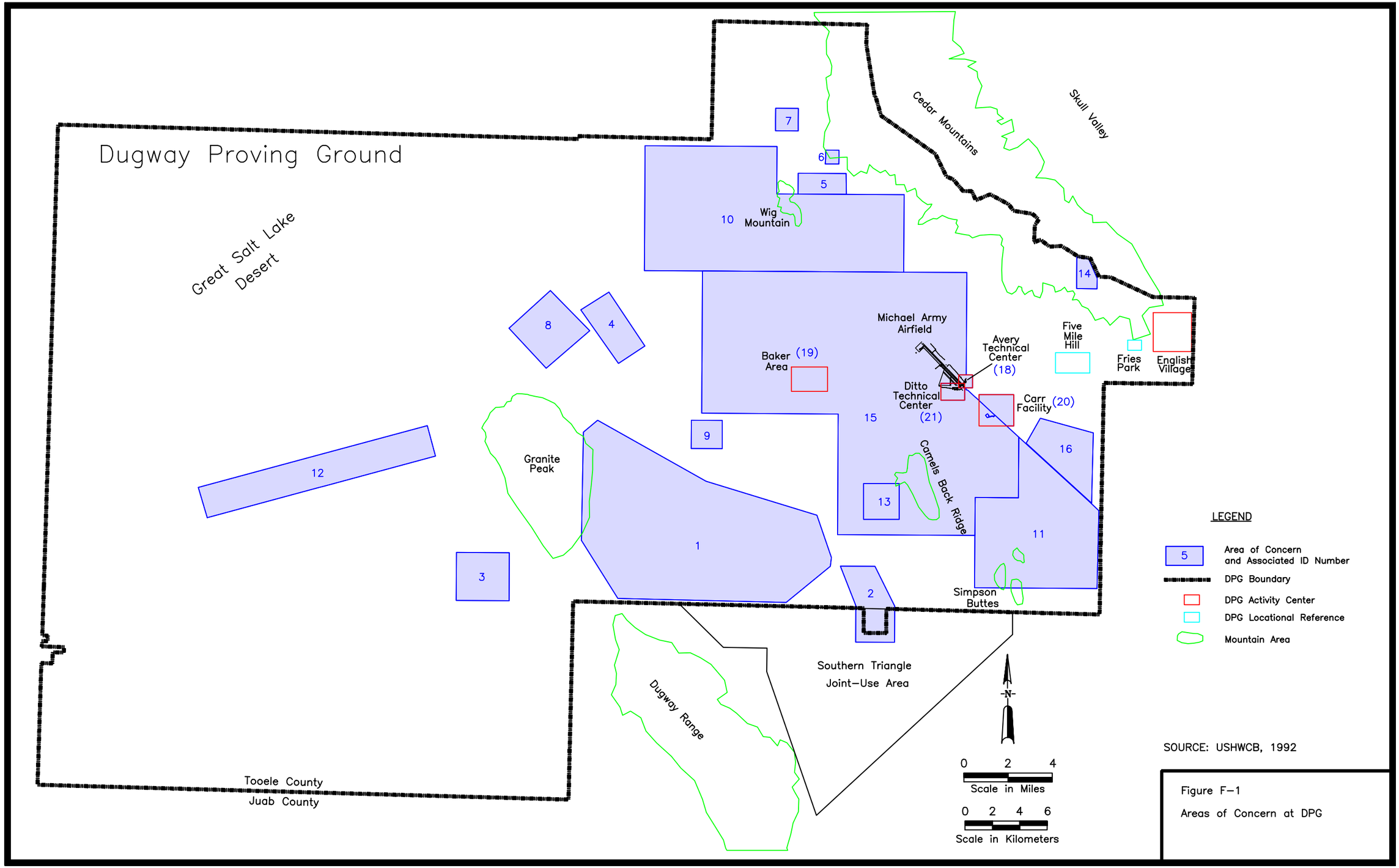
Dugway Proving Ground
Great Salt Lake Desert
Cedar Mountains
Skull Valley
Wig Mountain
Michael Army Airfield
Avery Technical Center (18)
Five Mile Hill
Fries Park
English Village
Baker Area (19)
Ditto Technical Center (21)
Carr Facility (20)
Camels Back Ridge
Granite Peak
Simpson Buttes
Southern Triangle Joint–Use Area
Dugway Range
Tooele County
Juab County
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
LEGEND
Area of Concern and Associated ID Number
DPG Boundary
DPG Activity Center
DPG Locational Reference
Mountain Area
N
0 2 4
Scale in Miles
0 2 4 6
Scale in Kilometers
SOURCE: USHWCB, 1992
Figure F–1
Areas of Concern at DPG

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX G*

*Drinking Water Supply Wells at DPG*

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# Drinking Water Supply Wells at DPG

Appendix G provides the 1999 analytical results for groundwater samples collected from the drinking water supply Wells 3, 5, 27, 28, and 30 at DPG in Table G-1, 1999 Analytical Results for the Drinking Water Supply Wells at DPG.

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**Table G-1. 1999 Analytical Results for the Drinking Water Supply Wells at DPG.**

| Parameter Group Name, Method Name, and/or Method Number | Analyte | Method Reporting or Detection Limit | Maximum Contaminant Level [+] | Well 3 | Well 5 | Well 27 [++] | Well 28 | Well 30 |
|---|---|---|---|---|---|---|---|---|
| Regulated Volatile Organic Compounds by GC/MS, EPA Method 524.2 | 1,1-Dichloroethylene | 0.5 µg/L | 7 µg/L | ND | ND | ND | ND | ND |
| | 1,2-Dibromo-3-chloropropane | 0.5 µg/L | 0.2 µg/L | ND | ND | ND | ND | ND |
| | 1,2-Dichloroethane | 0.5 µg/L | 5µg/L | ND | ND | ND | ND | ND |
| | *cis*-1,2-Dichloroethylene | 0.5 µg/L | 70 µg/L | ND | ND | ND | ND | ND |
| | *trans*-1,2-Dichloroethylene | 0.5 µg/L | 100 µg/L | ND | ND | ND | ND | ND |
| | 1,2-Dichloropropane | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | 1,1,1-Trichloroethane | 0.5 µg/L | 200 µg/L | ND | ND | ND | ND | ND |
| | 1,1,2-Trichloroethane | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | 1,2,4-Trichlorobenzene | 0.5 µg/L | 70 µg/L | ND | ND | ND | ND | ND |
| | Benzene | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | Carbon Tetrachloride | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | *o*-Dichlorobenzene | 0.5 µg/L | 600 µg/L | ND | ND | ND | ND | ND |
| | *p*-Dichlorobenzene | 0.5 µg/L | 75 µg/L | ND | ND | ND | ND | ND |
| | Dichloromethane | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | Ethylbenzene | 0.5 µg/L | 700 µg/L | ND | ND | ND | ND | ND |
| | Ethylene dibromide | 0.5 µg/L | 0.05 µg/L | ND | ND | ND | ND | ND |
| | Monochlorobenzene | 0.5 µg/L | 100 µg/L | ND | ND | ND | ND | ND |
| | Styrene | 0.5 µg/L | 100 µg/L | ND | ND | ND | ND | ND |
| | Tetrachloroethylene | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | Toluene | 0.5 µg/L | 1,000 µg/L | ND | ND | ND | ND | ND |
| | Trichloroethylene | 0.5 µg/L | 5 µg/L | ND | ND | ND | ND | ND |
| | Vinyl chloride | 0.5 µg/L | 2 µg/L | ND | ND | ND | ND | ND |
| | Xylenes (total) | 0.5 µg/L | 10,000 µg/L | ND | ND | ND | ND | ND |
| List 1 Unregulated Volatile Organic Compounds by GC/MS, EPA Method 524.2 | 1,1-Dichloroethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,1-Dichloropropene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,1,1,2-Tetrachloroethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,1,2,2-Tetrachloroethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,2,3-Trichloropropane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,3-Dichloropropane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *cis*-1,3-Dichloropropene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *trans*-1,3-Dichloropropene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 2,2-Dichloropropane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Bromobenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |

**Table G-1. 1999 Analytical Results for the Drinking Water Supply Wells at DPG.**

| Parameter Group Name, Method Name, and/or Method Number | Analyte | Method Reporting or Detection Limit | Maximum Contaminant Level [+] | Well 3 | Well 5 | Well 27 [++] | Well 28 | Well 30 |
|---|---|---|---|---|---|---|---|---|
| List 1 Unregulated Volatile Organic Compounds by GC/MS, EPA Method 524.2 (continued) | Bromodichloromethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Bromoform | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Bromomethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Chlorodibromomethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Chloroethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Chloroform | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Chloromethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *o*-Chlorotoluene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *p*-Chlorotoluene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Dibromomethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *m*-Dichlorobenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| List 3 Unregulated Volatile Organic Compounds by GC/MS, EPA Method 524.2 | 1,2,3-Trichlorobenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,2,4-Trimethylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | 1,3,5-Trimethylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Bromochloromethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *n*-Butylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *sec*-Butylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *tert*-Butylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Dichlorodifluoromethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Fluorotrichloromethane | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Hexachlorobutadiene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Isopropylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *p*-Isopropyltoluene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | Napthalene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| | *n*-Propylbenzene | 0.5 µg/L | NA | ND | ND | ND | ND | ND |
| Inorganics and Metals | Cyanide | <0.01 mg/L | 0.2 mg/L | <0.01 mg/L | <0.01 mg/L | <0.01 mg/L | <0.01 mg/L | <0.01 mg/L |
| | Fluoride | * | 4 mg/L | 0.62 mg/L | 0.33 mg/L | 0.54 mg/L | 0.38 mg/L | 0.58 mg/L |
| | Nitrate and Nitrite, measured as Nitrogen | * | *** | 1.7566 mg/L | 1.7931 mg/L | 0.53705 mg/L | 2.3301 mg/L | 0.18053 mg/L |
| | Sulfate | * | NA | 81.6 mg/L | 51.6 mg/L | 44.6 mg/L | 85.0 mg/L | 40.4 mg/L |
| | Total Dissolved Solids at 180 °C | * | NA | 968 mg/L | 596 mg/L | 598 mg/L | 982 mg/L | 574 mg/L |
| | Turbidity | * | 5 NTU | 0.445 NTU | 2.93 NTU | 0.23 NTU | 0.322 NTU | 0.189 NTU |

**Table G-1. 1999 Analytical Results for the Drinking Water Supply Wells at DPG.**

| Parameter Group Name, Method Name, and/or Method Number | Analyte | Method Reporting or Detection Limit | Maximum Contaminant Level [+] | Well 3 | Well 5 | Well 27 [++] | Well 28 | Well 30 |
|---|---|---|---|---|---|---|---|---|
| Inorganics and Metals (continued) | T-Antimony | <3.0 µg/L | 6 µg/L | <3.0 µg/L | <3.0 µg/L | <3.0 µg/L | <3.0 µg/L | <3.0 µg/L |
| | T-Arsenic | * | 50 µg/L | 9.849 µg/L | 2.227 µg/L | 16.46 µg/L | 7.741 µg/L | 21.1 µg/L |
| | T-Barium | * | 2 mg/L | 0.037 mg/L | 0.079 mg/L | 0.181 mg/L | 0.036 mg/L | 0.192 mg/L |
| | T-Beryllium | <1 µg/L | 4 µg/L | <1 µg/L | <1 µg/L | <1 µg/L | <1 µg/L | <1 µg/L |
| | T-Cadmium | <1 µg/L | 5 µg/L | <1 µg/L | <1 µg/L | <1 µg/L | <1 µg/L | <1 µg/L |
| | T-Chromium | <5.0 µg/L | 10 µg/L | 5.896 µg/L | 6.174 µg/L | <5.0 µg/L | <5.0 µg/L | <5.0 µg/L |
| | T-Copper | <12.0 µg/L | 1,300 µg/L [+++] | <12.0 µg/L | <12.0 µg/L | <12.0 µg/L | <12.0 µg/L | <12.0 µg/L |
| | T-Lead | <3.0 µg/L | 15 µg/L [+++] | <3.0 µg/L | <3.0 µg/L | 11.26 µg/L | <3.0 µg/L | <3.0 µg/L |
| | T-Mercury | <0.2 µg/L | 2 µg/L | <0.2 µg/L | <0.2 µg/L | <0.2 µg/L | <0.2 µg/L | <0.2 µg/L |
| | T-Nickel | <10.0 µg/L | NA | <10.0 µg/L | <10.0 µg/L | <10.0 µg/L | <10.0 µg/L | <10.0 µg/L |
| | T-Selenium | * | 50 µg/L | 1.921 µg/L | 1.486 µg/L | 1.309 µg/L | 2.004 µg/L | 1.139 µg/L |
| | T-Sodium | * | NA | 314.0 mg/L | 122.0 mg/L | 131.0 mg/L | 320.0 mg/L | 127.0 mg/L |
| | T-Thallium | <1.0 µg/L | 2 µg/L | <1.0 µg/L | <1.0 µg/L | <1.0 µg/L | <1.0 µg/L | <1.0 µg/L |
| Radiochemistry | Radon | * | NA | 740 pCi/L | 700 pCi/L | 610 pCi/L | 770 pCi/L | 700 pCi/L |
| Method 531.1 | 3-Hydroxycarbofuran | 0.5 µg/L | NA | ND | ND | ** | ND | ** |
| | Aldicarb | 0.3 µg/L | NA | ND | ND | ** | ND | ** |
| | Aldicarb sulfone | 0.4 µg/L | NA | ND | ND | ** | ND | ** |
| | Aldicarb sulfoxide | 0.7 µg/L | NA | ND | ND | ** | ND | ** |
| | Carbaryl | 0.2 µg/L | NA | ND | ND | ** | ND | ** |
| | Carbofuran | 0.7 µg/L | 40 µg/L | ND | ND | ** | ND | ** |
| | Methomyl | 0.3 µg/L | NA | ND | ND | ** | ND | ** |
| | Oxamyl | 0.6 µg/L | NA | ND | ND | ** | ND | ** |
| Regulated Chlorinated Acids, Method 515.1 | 2,4-Dichlorophenoxyacetic acid | 0.22 µg/L | 70 µg/L | ND | ND | ** | ND | ** |
| | 2,4,5-TP (Silvex) | 0.44 µg/L | 50 µg/L | ND | ND | ** | ND | ** |
| | Dalapon | 2.2 µg/L | 200 µg/L | ND | ND | ** | ND | ** |
| | Dinoseb | 0.44 µg/L | 7 µg/L | ND | ND | ** | ND | ** |
| | Pentachlorophenol | 0.08 µg/L | 1 µg/L | ND | ND | ** | ND | ** |
| | Picloram | 0.22 µg/L | 500 µg/L | ND | ND | ** | ND | ** |
| Unregulated Chlorinated Acids, Method 515.1 | Dicamba | 0.4 µg/L | NA | ND | ND | ** | ND | ** |

**Table G-1. 1999 Analytical Results for the Drinking Water Supply Wells at DPG.**

| Parameter Group Name, Method Name, and/or Method Number | Analyte | Method Reporting or Detection Limit | Maximum Contaminant Level + | Well 3 | Well 5 | Well 27 ++ | Well 28 | Well 30 |
|---|---|---|---|---|---|---|---|---|
| Regulated Semivolatiles by GC/MS, EPA Method 525 | Alachlor | 0.40 µg/L | 2 µg/L | ND | ND | ** | ND | ** |
| | Alpha-chlordane | 0.08 µg/L | NA | ND | ND | ** | ND | ** |
| | Atrazine | 0.20 µg/L | 3 µg/L | ND | ND | ** | ND | ** |
| | Benzo (a) pyrene | 0.04 µg/L | 0.2 µg/L | ND | ND | ** | ND | ** |
| | Bis (2-ethylhexyl) adipate | 0.60 µg/L | 400 µg/L | ND | ND | ** | ND | ** |
| | Bis (2-ethylhexyl) phthalate | 0.60 µg/L | 6 µg/L | ND – 0.76 µg/L | 0.74 µg/L | ** | ND | ** |
| | Chlorobiphenyl | 0.04 µg/L | NA | ND | ND | ** | ND | ** |
| | Dichlorobiphenyl | 0.07 µg/L | NA | ND | ND | ** | ND | ** |
| | Endrin | 0.03 µg/L | 2 µg/L | ND | ND | ** | ND | ** |
| | Gamma-chlordane | 0.08 µg/L | NA | ND | ND | ** | ND | ** |
| | Heptachlor | 0.09 µg/L | 0.4 µg/L | ND | ND | ** | ND | ** |
| | Heptachlor epoxide | 0.04 µg/L | 0.2 µg/L | ND | ND | ** | ND | ** |
| | Heptachlorobiphenyl | 0.07 µg/L | NA | ND | ND | ** | ND | ** |
| | Hexachlorobenzene | 0.22 µg/L | 1 µg/L | ND | ND | ** | ND | ** |
| | Hexachlorobiphenyl | 0.08 µg/L | NA | ND | ND | ** | ND | ** |
| | Hexachlorocyclopentadiene | 0.22 µg/L | 50 µg/L | ND | ND | ** | ND | ** |
| | Lindane | 0.05 µg/L | 0.2 µg/L | ND | ND | ** | ND | ** |
| | Methoxychlor | 0.22 µg/L | 40 µg/L | ND | ND | ** | ND | ** |
| | Octachlorobiphenyl | 0.08 µg/L | NA | ND | ND | ** | ND | ** |
| | Pentachlorobiphenyl | 0.07 µg/L | NA | ND | ND | ** | ND | ** |
| | Pentachlorophenol | 1.00 µg/L | 1 µg/L | ND | ND | ** | ND | ** |
| | Simazine | 0.15 µg/L | 4 µg/L | ND | ND | ** | ND | ** |
| | Tetrachlorobiphenyl | 0.06 µg/L | NA | ND | ND | ** | ND | ** |
| | Toxaphene | 1.00 µg/L | 3 µg/L | ND | ND | ** | ND | ** |
| | Tran nonachlor | 0.03 µg/L | NA | ND | ND | ** | ND | ** |
| | Trichlorobiphenyl | 0.08 µg/L | NA | ND | ND | ** | ND | ** |
| Unregulated Semivolatiles by GC/MS, EPA Method 525 | Aldrin | 0.07 µg/L | NA | ND | ND | ** | ND | ** |
| | Butachlor | 0.10 µg/L | NA | ND | ND | ** | ND | ** |
| | Dieldrin | 0.04 µg/L | NA | ND | ND | ** | ND | ** |
| | Metolachlor | 0.06 µg/L | NA | ND | ND | ** | ND | ** |
| | Metribuzin | 0.04 µg/L | NA | ND | ND | ** | ND | ** |
| | Propachlor | 0.12 µg/L | NA | ND | ND | ** | ND | ** |
| | Chlordane | 0.4 µg/L | 2 µg/L | ND | ND | ** | ND | ** |
| | Endrin | 0.02 µg/L | 2 µg/L | ND | ND | ** | ND | ** |

**Table G-1. 1999 Analytical Results for the Drinking Water Supply Wells at DPG.**

| Parameter Group Name, Method Name, and/or Method Number | Analyte | Method Reporting or Detection Limit | Maximum Contaminant Level + | Well 3 | Well 5 | Well 27 ++ | Well 28 | Well 30 |
|---|---|---|---|---|---|---|---|---|
| EPA Method 505 | Heptachlor | 0.04 µg/L | 0.4 µg/L | ND | ND | ** | ND | ** |
| | Heptachlor epoxide | 0.04 µg/L | 0.2 µg/L | ND | ND | ** | ND | ** |
| | Hexachlorobenzene | 0.1 µg/L | 1 µg/L | ND | ND | ** | ND | ** |
| | Hexachlorocyclopentadiene | 0.2 µg/L | 50 µg/L | ND | ND | ** | ND | ** |
| | Lindane | 0.02 µg/L | 0.2 µg/L | ND | ND | ** | ND | ** |
| | Methoxychlor | 0.1 µg/L | 40 µg/L | ND | ND | ** | ND | ** |
| | PCB 1016 Arochlor | 0.08 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | PCB 1221 Arochlor | 0.1 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | PCB 1232 Arochlor | 0.1 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | PCB 1242 Arochlor | 0.1 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | PCB 1248 Arochlor | 0.1 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | PCB 1254 Arochlor | 0.1 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | PCB 1260 Arochlor | 0.1 µg/L | 0.5 µg/L | ND | ND | ** | ND | ** |
| | Toxaphene | 1.0 µg/L | 3 µg/L | ND | ND | ** | ND | ** |



\+ A maximum contaminant level is the maximum permissible level of a contaminant in water that is delivered to any user of a public water system. Maximum contaminant levels are based on National Primary Drinking Water Regulations or primary standards that are legally enforceable that apply to public water systems.

++ Samples collected from Well 27 are also representative of the water quality in Well 26.

+++ The concentration listed is an action level which notifies water system operators to take treatment steps if this concentration is exceeded in more than 10 percent of the tap water samples.

* A method reporting limit or detection limit was not reported in the Environmental Chemistry Analysis Report (USDH, 1999).

** The sample was not analyzed for this analyte.

*** The maximum contaminant level for nitrate (measured as nitrogen) is 10 mg/L and for nitrite (measured as nitrogen) is 1 mg/L.

| | | | | | |
|---|---|---|---|---|---|
| < | less than | MS | Mass Spectrometry | pCi/L | picocuries per liter |
| °C | degrees Celsius | NA | not applicable | T | Total |
| EPA | U.S. Environmental Protection Agency | ND | not detected | µg/L | micrograms per liter |
| GC | Gas Chromatography | NTU | Nephelometric Turbidity Units | | |
| mg/L | milligrams per liter | PCB | polychlorinated biphenyl | | |

SOURCE: USDH, 1999

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX H*

*Air Emissions Data for DPG*

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# Air Emissions Data for DPG

This appendix presents the results of DPG's annual inventory of air emissions in accordance with Utah Air Conservation R307-155. Air emission data are presented for the baseline years, 1996 through 1998. The inventory shows emission sources and estimated annual emissions for criteria pollutants and HAPs. Criteria pollutant emissions by DPG source categories and HAP emissions are provided in the following tables:

- Table H-1, Annual Criteria Pollutant Emission Summary by Source Category for 1996
- Table H-2, Annual Criteria Pollutant Emission Summary by Source Category for 1997
- Table H-3, Annual Criteria Pollutant Emission Summary by Source Category for 1998
- Table H-4, Hazardous Air Pollutant Emissions for 1996, 1997, and 1998

Because take-offs and landings at MAAF were not reported in the annual inventory of air emissions until 1999, baseline emissions for take-offs and landings are not reported in these tables.

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**Table H-1. Annual Criteria Pollutant Emission Summary by Source Category for 1996.**

| Source Category | $PM_{10}$ (pounds per year) | Sulfur Oxides (pounds per year) | Nitrogen Oxides (pounds per year) | Carbon Monoxide (pounds per year) | Volatile Organic Compounds (pounds per year) |
|---|---|---|---|---|---|
| Boilers | 885 | 57,815 | 16,668 | 4,098 | 273 |
| Generators | 2,789 | 2,609 | 38,667 | 9,268 | 3,202 |
| Aboveground and underground storage tanks | 0 | 0 | 0 | 0 | 848 |
| Degreasing | 0 | 0 | 0 | 0 | 803 |
| Routine painting operations | 0 | 0 | 0 | 0 | 33 |
| Photo processing | 0 | 0 | 0 | 0 | 2,145 |
| Fuel dispensing | 0 | 0 | 0 | 0 | 15,306 |
| Aviation fuel dispensing | 0 | 0 | 0 | 0 | 48 |
| Pesticide/herbicide | 0 | 0 | 0 | 0 | 10 |
| Woodworking operations | 4.50 | 0 | 0 | 0 | 0 |
| Landfills | 0 | 0 | 0 | 0 | 2,390 |
| Medical clinic chemical sources | 0 | 0 | 0 | 0 | 50 |
| Fugitive dust from routine dirt road travel | 193,234 | 0 | 0 | 0 | 0 |
| Fugitive dust from training activities | 377,356 | 0 | 0 | 0 | 0 |
| Fugitive dust from outdoor testing | 1,869 | 0 | 0 | 0 | 0 |
| Outdoor testing | 59,713 | 0 | 278 | 0 | 1,801 |
| Petroleum-contaminated soils | 0 | 0 | 0 | 0 | 312 |
| Reginald Kendall Combined Chemical Test Facility | not available | not available | not available | not available | not available |
| Open detonation | not available | not available | not available | not available | not available |
| Open burning | not available | not available | not available | not available | not available |
| **TOTAL (pounds per year)** | **635,851** | **60,424** | **55,614** | **13,365** | **27,221** |
| **TOTAL (tons per year)** | **318** | **30** | **28** | **7** | **14** |

$PM_{10}$ particulate matter less than 10 microns

SOURCE: AGEISS, 1997a

**Table H-2. Annual Criteria Pollutant Emission Summary by Source Category for 1997.**

| Source Category | $PM_{10}$ (pounds per year) | Sulfur Oxides (pounds per year) | Nitrogen Oxides (pounds per year) | Carbon Monoxide (pounds per year) | Volatile Organic Compounds (pounds per year) |
|---|---|---|---|---|---|
| Boilers | 962 | 63,039 | 18,088 | 4,456 | 298 |
| Generators | 2,497 | 2,336 | 35,530 | 9,293 | 2,976 |
| Underground storage tanks | 0 | 0 | 0 | 0 | 78 |
| Aboveground storage tanks | 0 | 0 | 0 | 0 | 778 |
| Degreasing | 0 | 0 | 0 | 0 | 1,335 |
| Routine painting operations | 0 | 0 | 0 | 0 | 33 |
| Photo processing | 0 | 0 | 0 | 0 | 5,343 |
| Fuel dispensing | 0 | 0 | 0 | 0 | 14,718 |
| Aviation fuel dispensing | 0 | 0 | 0 | 0 | 77 |
| Pesticide/herbicide | 0 | 0 | 0 | 0 | 5 |
| Woodworking operations | 4.50 | 0 | 0 | 0 | 0 |
| Landfills | 0 | 0 | 0 | 0 | 1,140 |
| Medical clinic chemical sources | 0 | 0 | 0 | 0 | 50 |
| Fugitive dust from routine dirt road travel | 193,234 | 0 | 0 | 0 | 0 |
| Fugitive dust from training activities | 392,488 | 0 | 0 | 0 | 0 |
| Fugitive dust from outdoor testing | 6,674 | 0 | 0 | 0 | 0 |
| Outdoor testing | 55,774 | 0 | 2 | 85 | 241,658 |
| Petroleum contaminated soils | 0 | 0 | 0 | 0 | 113 |
| Reginald Kendall Combined Chemical Test Facility | 0 | 0 | 0 | 0 | 51 |
| Open detonation | 1,589 | 1 | 58 | 54 | 2 |
| Open burning | 4 | 0 | 0 | 0 | 0 |
| **TOTAL (pounds per year)** | **653,226** | **65,376** | **53,678** | **13,888** | **268,655** |
| **TOTAL (tons per year)** | **327** | **33** | **27** | **7** | **134** |

$PM_{10}$ particulate matter less than 10 microns

SOURCE: AGEISS, 1998a

**Table H-3. Annual Criteria Pollutant Emission Summary by Source Category for 1998.**

| Source Category | $PM_{10}$ (pounds per year) | Sulfur Oxides (pounds per year) | Nitrogen Oxides (pounds per year) | Carbon Monoxide (pounds per year) | Volatile Organic Compounds (pounds per year) |
|---|---|---|---|---|---|
| Boilers | 409 | 26,496 | 7765 | 1,895 | 125 |
| Generators | 1,770 | 1,655 | 25,182 | 5,928 | 2,079 |
| Aboveground and underground storage tanks | 0 | 0 | 0 | 0 | 1,006 |
| Degreasing | 0 | 0 | 0 | 0 | 657 |
| Routine painting operations | 0 | 0 | 0 | 0 | 0 |
| Photo processing | 0 | 0 | 0 | 0 | 4,463 |
| Fuel dispensing | 0 | 0 | 0 | 0 | 13,756 |
| Aviation fuel dispensing | 0 | 0 | 0 | 0 | 38 |
| Pesticide/herbicide | 0 | 0 | 0 | 0 | 6 |
| Woodworking operations | 0 | 0 | 0 | 0 | 0 |
| Landfills | 0 | 0 | 0 | 0 | 1,232 |
| Medical clinic chemical sources | 0 | 0 | 0 | 0 | 17 |
| Fugitive dust from routine dirt road travel | 193,235 | 0 | 0 | 0 | 0 |
| Fugitive dust from training activities | 1,139,906 | 0 | 0 | 0 | 0 |
| Fugitive dust from outdoor testing | 12,387 | 0 | 0 | 0 | 0 |
| Outdoor testing | 27,593 | 0 | 2 | 86 | 16,454 |
| Petroleum contaminated soils | 0 | 0 | 0 | 0 | 36 |
| Reginald Kendall Combined Chemical Test Facility | 0 | 0 | 0 | 0 | 61 |
| Open detonation | 557 | 1 | 34 | 31 | 1 |
| Open burning | 0 | 0 | 0 | 0 | 0 |
| **TOTAL (pounds per year)** | **1,375,857** | **28,152** | **32,983** | **7,940** | **39,931** |
| **TOTAL (tons per year)** | **688** | **14** | **16** | **4** | **20** |

$PM_{10}$ particulate matter less than 10 microns

SOURCE: AGEISS, 1999b

**Table H-4. Hazardous Air Pollutant Emissions for 1996, 1997, and 1998.**

| Chemical Name | 1996 Total (lb/yr) | 1997 Total (lb/yr) | 1998 Total (lb/yr) | Principal Source (> 1 lb HAP) |
|---|---|---|---|---|
| 1,1,2,2-Tetrachloroethane | 9 | 4 | 5 | Municipal Landfill |
| 1,1,2-Trichloroethane | 1 | 0 | 0 | -- |
| 1,3-Butadiene | 0 | 0 | 0 | -- |
| 1,4-Dichlorobenzene | 0 | 0 | 0 | -- |
| 2,2,4-Trimethylpentane | 0 | 0 | 0 | -- |
| 2,4-Dinitrotoluene | 0 | 0 | 0 | -- |
| Acetaldehyde | 7 | 6 | 4 | Generators |
| Acetophenone | 0 | 0 | 0 | |
| Acrolein | 1 | 1 | 1 | Generators |
| Acrylonitrile | 28 | 14 | 15 | Municipal Landfill |
| Allyl chloride | 0 | 0 | 0 | -- |
| Benzene (including benzene from gasoline) | 552 | 528 | 491 | Fuel Dispensing |
| Benzyl chloride | 0 | 0 | 0 | -- |
| Bis(2-ethylhexyl) phthalate (DEHP) | 0 | 0 | 0 | -- |
| Carbon disulfide | 2 | 1 | 1 | Municipal Landfill |
| Carbon tetrachloride | 80 | 0 | 0 | -- |
| Carbonyl sulfide | 1 | 1 | 1 | Municipal Landfill |
| Chlorobenzene | 1 | 1 | 1 | Municipal Landfill |
| Chloroform | 0 | 7 | 24 | Various |
| Dibenzofurans | 0 | 0 | 0 | -- |
| Dibutyl phthalate | 0 | 0 | 0 | -- |
| Dimethyl phthalate | 0 | 0 | 0 | -- |
| Ethyl benzene | 330 | 307 | 287 | Fuel Dispensing |
| Ethyl chloride (chloroethane) | 0 | 0 | 0 | -- |
| Ethylene dichloride (1,2-dichloroethane) | 0 | 0 | 0 | -- |
| Ethylidene dichloride (1,1-dichloroethane) | 0 | 0 | 1 | -- |
| Formaldehyde | 60 | 63 | 29 | Generators |
| Hexane | 793 | 754 | 704 | Fuel Dispensing |
| Hexachlorobenzene | 24 | 32 | 0 | -- |
| Hexachloroethane | 13 | 18 | 0 | -- |
| Hydrochloric acid (hydrogen chloride) | 0 | 2 | 0 | Various |
| Methanol | 0 | 7 | 6 | Various |
| Methyl chloride (chloromethane) | 0 | 0 | 0 | -- |
| Methyl chloroform (1,1,1-trichloroethane) | 0 | 0 | 0 | -- |
| Methyl ethyl ketone (2-butanone) | 24 | 11 | 12 | Municipal Landfill |
| Methyl isobutyl ketone (hexone) | 6 | 6 | 3 | Municipal Landfill |
| Methyl tert butyl ether | 1,148 | 1,103 | 1,030 | Fuel Dispensing |
| Methylene chloride (dichloromethane) | 0 | 1 | 1 | Various |
| Naphthalene | 3 | 4 | 3 | Various |
| Phenol | 0 | 0 | 0 | -- |
| Phosphine | 27 | 36 | 0 | Smoke tests |
| Propylene oxide | 23 | 21 | 15 | Generators |
| Styrene | 0 | 0 | 0 | -- |

**Table H-4. Hazardous Air Pollutant Emissions for 1996, 1997, and 1998.**

| Chemical Name | 1996 Total (lb/yr) | 1997 Total (lb/yr) | 1998 Total (lb/yr) | Principal Source (> 1 lb HAP) |
|---|---|---|---|---|
| Tetrachloroethylene (perchloroethylene) | 29 | 14 | 15 | Municipal Landfill |
| Toluene | 1,554 | 1,430 | 1,330 | Fuel Dispensing |
| Vinyl chloride | 21 | 10 | 11 | Municipal Landfill |
| Vinylidene chloride (1,1-dichloroethylene) | 0 | 0 | 0 | -- |
| Xylenes (isomers and mixture) | 1,446 | 1,363 | 1,270 | Fuel Dispensing |
| Arsenic compounds (inorganic including arsine) | 1 | 1 | 0 | Boilers |
| Beryllium compounds | 0 | 0 | 0 | -- |
| Cadmium compounds | 1 | 7 | 4 | Open Detonation |
| Chromium compounds | 5 | 6 | 0 | Boilers |
| Lead compounds | 5 | 3 | 2 | Various |
| Manganese compounds | 2 | 2 | 1 | Boilers |
| Mercury compounds | 1 | 1 | 1 | Municipal Landfill |
| Nickel compounds | 2 | 21 | 9 | Boilers |
| **TOTAL HAPs** | **6,200** | **5,786** | **5,277** | |
| Zinc chloride (military material, not a HAP) | 1,660 | 2248 | 0 | Smoke tests |

> greater than
-- not evaluated for emissions < 0.5 lb
lb pound(s)
lb/yr pound(s) per year
HAP hazardous air pollutant

NOTE: Values have been rounded to the nearest whole number. Zero values represent quantities > 0 and < 0.5 lb. Total represents all values even if the value is < 0.5 lb.

SOURCES: AGEISS, 1997a; AGEISS, 1998a; AGEISS, 1999b

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX I*

*Biological Resources at DPG*

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# Biological Resources at DPG

Appendix I provides tables listing historical and current biological resources present at DPG. The following tables are in this appendix:

- Table I-1, Common Vegetation Present at DPG
- Table I-2, Wildlife Species Historically and Currently Present at DPG and Their Habitats
- Table I-3, Avian Species Historically and Currently Present at DPG and Their Habitats
- Table I-4, Bats Captured at DPG During a 1995 Survey

*Red-tail hawks are current and historic avian species at DPG.*

*Kit fox populations are a native carnivore species at DPG.*

**Table I-1. Common Vegetation Present at DPG.**

| Common Name | Scientific Name | Type | Native/Exotic |
|---|---|---|---|
| Juniper | *Juniperus osteosperma* | Tree | Native |
| Greasewood | *Sarcobatus vermiculatus* | Shrub | Native |
| Nevada ephedra | *Ephedra nevadensis* | Shrub | Native |
| Horsebrush | *Tetradymia glabrata* | Shrub | Native |
| Nuttall's horsebrush | *Tetradymia nuttalli* | Shrub | Native |
| Viscid rabbitbrush | *Chrysothamnus viscidiflorus* | Shrub | Native |
| Rubber rabbitbrush | *Chrysothamnus nauseosus* | Shrub | Native |
| Dune rabbitbrush | *Chrysothamnus nauseosus var. turbinatus* | Shrub | Native |
| Black sagebrush | *Artemisia nova* | Shrub | Native |
| Big sage | *Artemisia tridentata* | Shrub | Native |
| Wyoming big sagebrush | *Artemisia tridentata var. wyomingensis* | Shrub | Native |
| Budsage | *Artemisia spinescens* | Shrub | Native |
| Hopsage | *Grayia spinosa* | Shrub | Native |
| Pickleweed | *Allenrolfea occidentalis* | Shrub | Native |
| Gray molly | *Kochia americana* | Shrub | Native |
| Gardner's saltbush | *Atriplex gardneri* | Shrub | Native |
| Four-wing saltbush | *Atriplex canescens* | Shrub | Native |
| Shadscale | *Atriplex confertifolia* | Shrub | Native |
| Broom snakeweed | *Gutierrezia sarothae* | Shrub | Native |
| Winterfat | *Ceratoides lanata* | Shrub | Native |
| Sharp slenderlobe | *Leptodactylon pungens* | Shrub | Native |
| Needle-and-thread | *Stipa comata* | Grass | Native |
| Sandberg's bluegrass | *Poa secunda* | Grass | Native |
| Alkali saccaton | *Sporobolus airoides* | Grass | Native |
| Coin buckwheat | *Eriogonum nummulare* | Grass | Native |
| Galleta (Warm season grass) | *Hilaria jamesii* | Grass | Native |
| Sand dropseed | *Sporobolus cryptandrus* | Grass | Native |
| Indian ricegrass | *Stipa hymenoides* | Grass | Native |
| Bluebunch wheatgrass | *Elymus spicatus* | Grass | Native |
| Squirreltail | *Elymus elymoides* | Grass | Native |
| Dune scurfpea | *Psoralidium lanceolatum* | Forb | Native |
| Pale evening primrose | *Oenothera pallida* | Forb | Native |
| Torrey seepweed | *Suaeda torreyanna* | Forb | Native |
| Wormwood | *Artemisia dracunculus* | Forb | Native |
| Narrowleaf paintbrush | *Castilleja angustifolia* | Forb | Native |
| Munroe's globemallow | *Sphaerakea munroana* | Forb | Native |
| Pretty wallflower | *Erysirnum asperum* | Forb | Native |
| Hoary aster | *Machaeranthera canescens* | Forb | Native |
| Cheatgrass | *Bromus tectorum* | Grass | Exotic |
| Peppercress | *Lepidium perfoliatum* | Forb | Exotic |
| Russian thistle | *Salsola iberica* | Forb | Exotic |
| Tamarisk | *Tamarix chinensis* | Tree | Exotic |
| Storksbill | *Erodium cicutarium* | Forb | Exotic |
| Halogeton | *Halogeton glomeratus* | Forb | Exotic |
| Bur buttercup | *Ranunculus testiculatus* | Forb | Exotic |
| Tumbling mustard | *Sisymbrium altissimum* | Forb | Exotic |
| Musk mustard | *Chorispora tenella* | Forb | Exotic |
| Tansy mustard | *Descurainia sophia* | Forb | Exotic |
| Five-hook bassia | *Bassia hyssopifolia* | Forb | Exotic |
| Pricky lettuce | *Lactuca serriola* | Forb | Exotic |

**Table I-2. Wildlife Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Historically Present |
| **SALIENTIA** | | | | | | | | | |
| PELOBATIDAE | | | | | | | | | |
| *Scaphious intermontanus* | Great Basin Spadefoot Toad | | | | | | | | • |
| *Scaphious hammond* | Western Spadefoot | | • | | | • | | | |
| **SQUAMATA** | | | | | | | | | |
| SCINCIDAE | | | | | | | | | |
| *Eumeces skildonianus utalensis* | Great Basin Skink | | | | | | • | | |
| IGUANIDAE | | | | | | | | | |
| *Crotophytus insularis bicinctores* | Great Basin Collared Lizard | | | • | • | • | • | | • |
| *Crotaphytus wilslizenii* | Long-nosed Leopard Lizard | | | • | | | | | • |
| *Sceloporus occidentalis* | Western Fence Lizard | | | | | • | | | • |
| *Sceloporus graciosus* | Sagebrush Lizard | | | | | | | | • |
| *Uta stansburiana* | Side-blotched Lizard | | | • | • | • | • | | • |
| *Phrymosoma platyrhinos* | Desert Horned Lizard | | | • | • | • | • | | • |
| *Phrymosoma douglasii* | Short-horned Lizard | | | • | • | • | • | | • |
| TEIIDAE | | | | | | | | | |
| *Cnemidophorus tigris* | Great Basin Whiptail | | | • | • | • | | | |
| COLUBRIDAE | | | | | | | | | |
| *Masticophis taeniatus* | Striped Whipsnake | | | • | | • | | | • |
| *Pituophis melanoleucus* | Gopher Snake | • | • | • | • | • | • | | • |
| *Thinocheilus lecontei* | Long-nosed Snake | • | | • | • | | | | • |
| *Hysiglena ochr. deserticola* | Desert Night Snake | • | | | | | | | |
| VIPERIDAE | | | | | | | | | |
| *Crotalus viridis lutosus* | Great Basin Rattlesnake | | | • | • | • | | | • |
| **CARNIVORA** | | | | | | | | | |
| BASSARISCIDAE | | | | | | | | | |
| *Bassariscus astutus* | Ringtail | | | | | | • | • | |
| PROCYONIDAE | | | | | | | | | |
| *Procyon lotor* | Racoon | | | | | • | | • | |
| MUSTELIDAE | | | | | | | | | |
| *Taxidea taxus* | Badger | | | • | | • | • | | • |
| *Mephitis mephitis* | Striped Skunk | • | | | | | | | |

**Table I-2. Wildlife Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Historically Present |
| *Spilogale gracilis* | Spotted Skunk | | | | | | | | • |
| CANIDAE | | | | | | | | | |
| *Vulpes vulpes* | Red Fox | • | | | | | | | |
| *Canis latrans* | Coyote | • | • | • | • | • | • | | • |
| *Vulpes macrotis* | Kit Fox | • | • | • | • | | | | • |
| *Urocyon cinereoargenteus* | Gray Fox[1] | | | | | | | | |
| FELIDAE | | | | | | | | | |
| *Puma concolor* | Cougar | | | | • | • | • | | • |
| *Lynx rufus pallescens* | Bobcat | | | • | • | • | • | | • |
| **RODENTIA** | | | | | | | | | |
| SCIURIDAE | | | | | | | | | |
| *Marmota flaviventris* | Yellow-bellied Marmot | • | | | | | | • | |
| *Spermophilus townsendii* | Townsend Ground Squirrel | | | | • | | | | • |
| *Ammospermophilus leucurus* | Whitetail Antelope Squirrel | | | • | | • | | | • |
| *Tamias minimus* | Least Chipmunk | | | | • | | | | • |
| *Tamias dorsalis* | Cliff Chipmunk | | | | | | | | • |
| GEOMYIDAE | | | | | | | | | |
| *Thomomys bottae* | Valley Pocket Gopher | • | | | | | | | |
| HETEROMYIDAE | | | | | | | | | |
| *Perognathus longimembris* | Little Pocket Mouse | | | • | | | | | • |
| *Perognathus parvus* | Great Basin Pocket Mouse | | | • | | • | | | • |
| *Chaetodipus formosus* | Longtail Pocket Mouse | | | | | • | | | • |
| *Microdipodops megacephalus* | Dark Kangaroo Mouse | | | • | | | | | • |
| *Dipodomys microps* | Chisel-toothed Kangaroo Rat | | | • | • | • | • | | • |
| *Dipodomys ordii* | Ord Kangaroo Rat | | | • | | • | • | | • |
| MURIDAE | | | | | | | | | |
| *Reithrodontomys megalotis* | Western Harvest Mouse | • | | • | • | • | • | | • |
| *Peromyscus crinitus* | Canyon Mouse | | | | | | | | • |
| *Peromyscus maniculatus* | Deer Mouse | • | • | • | • | • | • | | • |
| *Peromyscus truei* | Pinyon Mouse | | | • | | | • | | |
| *Onychomys leucogaster* | Northern Grasshopper Mouse | | • | • | | | | | • |

**Table I-2. Wildlife Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Historically Present |
| *Neotoma lepida* | Desert Wood Rat | | | | | • | | | • |
| *Neotoma cinerea* | Bushytail Wood Rat | | | | | • | | | • |
| *Microtus montanus* | Montane Vole | | | | | | | | • |
| *Mus musculus* | House Mouse | | | | | | | • | • |
| ERETHIZONTIDAE | | | | | | | | | |
| *Erethizon dorsatum* | Porcupine | | | • | • | • | | | • |
| **LAGOMORPHA** | | | | | | | | | |
| LEPORIDAE | | | | | | | | | |
| *Lepus californicus* | Blacktail Jackrabbit | • | | | • | • | • | | • |
| *Sylvilagus nuttallii* | Mountain Cottontail | • | | | • | • | | | |
| *Sylvilagus audubonii* | Desert Cottontail | | | • | • | • | | | |
| **ARTIODACTYLA** | | | | | | | | | |
| CERVIDAE | | | | | | | | | |
| *Odocoileus hemionus* | Mule Deer | • | | | | • | • | | • |
| ANTILOCAPRIDAE | | | | | | | | | |
| *Antilocapra americana* | Pronghorn | • | • | • | • | • | | | • |
| **PERISSODACTYLA** | | | | | | | | | |
| *Equis caballus* | Feral horse | • | | | • | • | • | | • |

1 hypothetical (unconfirmed)

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| **PODICIPEDIFORMES** | | | | | | | | | | |
| PODICIPEDIDAE | | | | | | | | | | |
| *Podilymbus podiceps podiceps* | Pied-billed Grebe | | | | | | | | • | • |
| *Podiceps nigricoil californicus* | Eared Grebe | | | | | | | | • | • |
| **CICONIFORMES** | | | | | | | | | | |
| ARDEIDAE | | | | | | | | | | |
| *Ardea herodias treganzai* | Great Blue Heron | | | | | | | | • | • |
| *Nycticorax nycticoran hoactli* | Black-crowned Night Heron | | | | | | | | • | • |
| *Egrete thula brewsteri* | Snowy Egret | | | | | | | | • | • |
| THRESKIORNITHIDAE | | | | | | | | | | |
| *Plegadis chihi* | White-faced Ibis | | • | | | | | | • | • |
| CATHARTIDAE | | | | | | | | | | |
| *Cathartes aura teter* | Turkey Vulture[2] | | | | | • | • | | | • |
| **ASERIFORMES** | | | | | | | | | | |
| ANATIDAE | | | | | | | | | | |
| *Anas platyrhrnchos* | Mallard | | | | | | | | • | • |
| *Anas strepera* | Gadwall | | | | | | | | • | • |
| *Anas acuta* | Northern Pintail | | | | | | | | • | • |
| *Anas discors* | Blue-winged Teal | | | | | | | | • | • |
| *Anas americana* | Cinnamon Teal | | | | | | | | • | • |
| *Anas crecca* | Green-winged Teal | | | | | | | | • | • |
| *Spatula clypeata* | Northern Shoveller | | | | | | | | • | • |
| *Aythya americana* | Redhead | | | | | | | | • | • |
| *Aythya collaris* | Ring-necked Duck | | | | | | | | • | • |
| *Oxyura jamaicensis* | Ruddy Duck | | | | | | | | • | • |
| **FALCONIFORMES** | | | | | | | | | | |
| ACCIPITRIDAE | | | | | | | | | | |
| *Accipiter striatus velox* | Sharp-shinned Hawk | | | | | | • | • | | • |
| *Accipiter cooperii* | Cooper's Hawk | | | | | | • | • | | • |
| *Buteo jamaicensis calurus* | Red-tailed Hawk | | | • | | • | • | • | | • |
| *Buteo regalis* | Ferruginous Hawk | | | | • | • | • | | | • |

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| *Buteo swainsoni* | Swainson's Hawk | • | | | • | • | • | | | • |
| *Buteo lagopus* | Rough-legged Hawk[3] | | | | | • | • | | | • |
| *Aquila chrysaetos canadensis* | Golden Eagle | • | | | | • | • | | | • |
| *Haliaeetus leucocephalus alascanus* | Bald Eagle[3] | | | | | • | • | | | • |
| *Circus cyaneus hudsonius* | Northern Harrier | • | | | | • | | | • | • |
| PANDIONIDAE | | | | | | | | | | |
| *Pandion haliaetus carolinenis* | Osprey | | | | | | | • | | • |
| FALCONIDAE | | | | | | | | | | |
| *Falco sparverius sparverius* | American Kestrel | | | | • | • | • | • | | • |
| *Falco mexicanus* | Prairie Falcon | | | | | • | | | | • |
| **GALLIFORMES** | | | | | | | | | | |
| PHASIANIDAE | | | | | | | | | | |
| *Alectoris chukar* | Chukar | | | | | | • | | | |
| **GRUIFORMES** | | | | | | | | | | |
| RALLIDAE | | | | | | | | | | |
| *Fulica americana* | American Coot | | | | | | | | • | |
| **CHARADRIIFORMES** | | | | | | | | | | |
| CHARADRIIDAE | | | | | | | | | | |
| *Charadrius alexandrinus nivosus* | Snowy Plover | | | | | | | | • | • |
| *Charadrius montanus* | Mountain Plover | | | | | | | | • | |
| *Charadrius vociferus* | Killdeer[4] | | | | | | | • | • | • |
| SCOLOPACIDAE | | | | | | | | | | |
| *Numenius americanus* | Long-billed Curlew[4] | • | | | | • | | | • | • |
| *Limosa fedoa* | Marbled Godwit[4] | | | | | | | | • | • |
| *Tringa melanoleucus* | Greater Yellow-legs[4] | | | | | | | | • | • |
| *Actitis macularia* | Spotted Sandpiper[4] | | | | | | | | • | • |
| *Gallinago gallinago* | Common Snipe[4] | | | | | | | | • | • |
| *Limnodromus scolopaceus* | Long-billed Dowitcher[4] | | | | | | | | • | • |
| *Catoptrophorus semipal;matus* | Willet[4] | | | | | | | | • | • |
| *Calidris minutilla* | Least Sandpiper[4] | | | | | | | | • | • |
| *Calidris mauri* | Western Sandpiper[4] | | | | | | | | • | • |

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| *Calidris melanotos* | Pectoral Sandpiper[4] | | | | | | | | • | • |
| *Phalaropus tricolor* | Wilson's Phalarope[4] | | | | | | | | • | • |
| RECURVIROSTRIDAE | | | | | | | | | | |
| *Himantopus mexicanus* | Black-necked Stilt[4] | | | | | | | | • | • |
| *Recurvirostra americana* | American Avocet[4] | | | | | | | | • | • |
| LARIDAE | | | | | | | | | | |
| *Larus pipixcan* | Franklin's Gull | | | | | | | | • | |
| *Larus californicus* | California Gull[4] | | | | • | • | | • | • | • |
| *Larus delawarensis* | Ring-billed Gull | | | | | | | | • | • |
| *Sterna caspia* | Caspian Tern | | | | | | | | • | • |
| *Chlidonias niger* | Black Tern | | | | | | | | • | |
| **COLUMBIFORMES** | | | | | | | | | | |
| COLUMBIDAE | | | | | | | | | | |
| *Columbia livia* | Rock or Feral Dove | | | | | | | • | | • |
| *Zenaidura macroura marginella* | Mourning Dove | | | | | | • | | | • |
| **STRIGIFORMES** | | | | | | | | | | |
| STRIGIDAE | | | | | | | | | | |
| *Bubo virginianus occidentalis* | Great Horned Owl | | | | | • | • | | | • |
| *Asio otus wilsonianus* | Long-eared Owl | | | | | | • | | | • |
| *Asiom flammeus* | Short-eared Owl | • | | | | | | | | • |
| *Athene cunicularia hypugaea* | Burrowing Owl | • | | | • | • | | | | • |
| **CAPRIMULGIFORMES** | | | | | | | | | | |
| CAPRIMULGIDAE | | | | | | | | | | |
| *Chordeiles minor hesperis* | Common Nighthawk | | | | | • | • | • | | • |
| *Phalaenoptilus nuttallii* | Common Poorwill | | | | | • | • | • | | • |
| **APODIFORMES** | | | | | | | | | | |
| TROCHILIDAE | | | | | | | | | | |
| *Archilochus alexandri* | Black-chinned Hummingbird | | | | | • | • | • | | |
| *Selasphorus platycercus* | Broad-tailed Hummingbird | | | | • | • | • | • | | |
| *Selasphorus rufus* | Rufous Hummingbird | | | | | • | • | • | | |

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| **CORACIIFORMES** | | | | | | | | | | |
| ALCEDINEDAE | | | | | | | | | | |
| *Megaceryle alcyon caurina* | Belted Kingfisher | | | | | | | | • | • |
| **PICICORMES** | | | | | | | | | | |
| PICIDA | | | | | | | | | | |
| *Colaptes auratus & C. cafer* | Northern Flicker (Red & Yellow-Shafted) | | | | | | • | • | | • |
| **PASSERIFORMES** | | | | | | | | | | |
| TYRANNIDAE | **Flycatchers** | | | | | | | | | |
| *Tyrannus tyrannus hespericola* | Eastern Kingbird | | | | | | • | • | | • |
| *Tyrannus verticalis* | Western Kingbird | | | | | • | • | • | | • |
| *Myiarchus cinerascens cinerascens* | Ash-throated Flycatcher | | | | | • | • | | | • |
| *Sayornis saya (saya, yukonensis)* | Say's Pheobe | | | | | • | • | • | | • |
| *Contopus sordidulus richardsonii* | Western Wood Peewee | | | | | | • | | | • |
| *Contopus borealis* | Olive-sided Flycatcher | | | | | | • | | | |
| *Empidonax hammondii* | Hammond Flycatcher | | | | | • | • | | | • |
| *Empidonax wrightii* | Gray Flycatcher | | | | | | • | | | • |
| ALAUDIDAE | **Larks** | | | | | | | | | |
| *Eremophila alpestris utahensis* | Horned Lark | • | • | • | • | | | | | • |
| HIRUNINIDAE | | | | | | | | | | |
| *Tachhycineta thalassina lepida* | Violet-green Swallow | | | | | | | | • | • |
| *Iridoprocne bicolor* | Tree Swallow | | | | | | | • | | • |
| *Hirundo rustica erythrogaster* | Barn Swallow | | | | | | | • | | • |
| *Petrochelidon pyrrhonota aprophata* | Cliff Swallow | | | | | • | • | • | | • |
| CORVIDA | **Crow, Jays** | | | | | | | | | |
| *Aphelocoma coerulescens nevadae* | Scrub Jay | | | | | | • | | | • |
| *Pica pica* | Black-billed Magpie | | | | | • | • | | | • |
| *Corvus corax sinuatus* | Common Raven | | | | • | • | • | | | • |
| PARIDAE | **Chickadees & Titmice** | | | | | | | | | |
| *Parus atricapillus nevadensis* | Black-capped Chickadee[2] | | | | | | • | | | |
| *Parus gambeli inyoensis* | Mountain Chickadee | | | | | | • | | | • |

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| *Parus inornatus griseus* | Juniper Titmouse | | | | | | • | | | • |
| *Psaltriparus minimus plumbeus* | Bushtit | | | | | • | • | | | • |
| SITTIDAE | **Nuthatches** | | | | | | | | | |
| *Sitta canadensis* | Red-breasted Nuthatch | | | | | | • | • | | • |
| TROGLYDYTIDAE | **Wrens** | | | | | | | | | |
| *Troglodytes aedon parkmanii* | House Wren | | | | | | • | • | | • |
| *Thryomanes bewickii eremophilus* | Bewick's Wren | | | | | • | • | | | • |
| *Salpinctes obsoletus* | Rock Wren | | | | | | • | | | • |
| *Telmatodytes palustris plesius* | Marsh Wren | | | | | | | | • | • |
| MIMIDAE | **Mimicks** | | | | | | | | | |
| *Mimus polyglottos leucopterus* | Northern Mockingbird | | | | | • | • | | | • |
| *Oreoscoptes montanus* | Sage Thrasher | | | | | • | | | | • |
| MUSCICAPIDAE | | | | | | | | | | |
| *Turdus migratorius propinguus* | American Robin | | | | | | • | • | | • |
| *Myadestes townsendi townsendi* | Townsend's Soliataire[3] | | | | | | • | • | | • |
| *Sialia currucoides* | Mountain Bluebird | | | | | • | • | | | • |
| *Regulus calendula cineraceus* | Ruby-crowned Kinglet | | | | | | • | | | • |
| *Poliopila caerulae amoenissima* | Blue-gray Gnatcatcher | | | | | • | • | | | • |
| LANIIDAE | | | | | | | | | | |
| *Lanius excubitor* | Northern Shrike[3] | | | | | • | • | | | • |
| *Lanius ludovicianus nauadensis* | Loggerhead Shrike | | | | | • | • | | | • |
| STURNIDAE | | | | | | | | | | |
| *Sturnus vulgaris* | Starling | | | | | | | • | | • |
| VIREONIDAE | | | | | | | | | | |
| *Vireo vicinior* | Gray Vireo | | | | | | • | | | |
| *Vireo gilvus* | Warbling vireo | | | | | | • | | | • |
| PARULIDAE | **Warblers** | | | | | | | | | |
| *Dendroica coronata auduboni* | Yellow-rumped Warbler[4] | | | | | | | • | | • |
| *Dendroica petachia aestiva* | Yellow Warbler | | | | | | | • | | • |
| *Dendroica nigrescens* | Black-throated Gray Warbler | | | | | • | • | | | • |
| *Seiurus noveborancensis* | Northern Water Thrush[4] | | | | | | | • | | • |

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| *Oporomis tolmiei monticola* | MacGillivary's Warbler[4] | | | | | | | • | | • |
| *Vermivora celata* | Orange-crowned Warbler[4] | | | | | | | • | | • |
| *Vermivora ruficapilla ridgwayi* | Nashville Warbler[4] | | | | | | | • | | • |
| *Vermivora virginiae* | Virginia's Warbler[4] | | | | | | | • | | • |
| *Wilsonia pusilla pileolata* | Wilson's Warbler[4] | | | | | | | • | | • |
| PLOCEIDAE | | | | | | | | | | |
| *Passer domesticus* | House Sparrow | | | | | | | • | | • |
| ICTERIDAE | | | | | | | | | | |
| *Sturnella neglecta neglecta* | Western Meadowlark | | | | • | • | | | | • |
| *Xanthocephalus xanthocephalus* | Yellow-headed Blackbird | | | | | | | | • | • |
| *Agelaius phoeniceus (utahensis,* | Red-winged Blackbird | | | | | | | | • | • |
| *nevadensis)* | | | | | | | | | | |
| *Icterus parisorum* | Scott's Oriole | | | | | • | • | | | • |
| *Icterus galbula* | Northern Oriole | | | | | | | • | | • |
| *Molothrus ater artemisiae* | Brown-headed Cowbird | • | | | • | • | • | • | | • |
| *Euphagus cyanocephalus* | Brewer's Blackbird | • | | | | | | • | | • |
| THRAUPIDAE | | | | | | | | | | |
| *Piranga ludoviciana* | Western Tanager | | | | | | • | • | | • |
| CARDINALIDAE | | | | | | | | | | |
| *Pheucticus melanocephalus* | Black-headed Grosbeak | | | | | | • | • | | • |
| *Passerina amoena* | Lazuli Bunting | | | | | | • | • | | • |
| FRINGILLIDAE | | | | | | | | | | |
| *Carpodacus mexicanus frontalis* | House Finch | | | | | | • | • | | • |
| *Carpodacus mexicanus frontalis* | Cassin's Finch[3] | | | | | | • | • | | • |
| *Carduelis pinus* | Pine Siskin[3] | | | | | | • | • | | |
| *Carduelis tristis pallidus* | American Goldfinch[3] | | | | | | • | • | | • |
| *Ammodramus savannarum* | Grasshopper Sparrow | | | | | • | • | | | • |
| *Pipilio chorura* | Green-tailed Towhee | | | | | • | • | | | • |
| *Passersrculus sandwichensis nevad.* | Savannah Sparrow[4] | • | | | • | • | | | | • |
| *Junco hyemalis* | Dark-eyed Junco[3] | | | | | | | • | | • |
| *Pooecetes gramineus* | Vesper's Sparrow[4] | | | | | • | | | | |

**Table I-3. Avian Species Historically and Currently Present at DPG and Their Habitats.**

| ORDER<br>FAMILY<br>*Species* | Common Name | Habitat | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Grassland | Pickleweed | Vegetated Dunes | Low Desert Scrub | High Desert Scrub | Pygmy Forest | Near Buildings and English Village | Water[1] | Historically Present |
| *Zonotrichia leucophrys oriantha* | White-crowned Sparrow[3] | | | | | • | • | • | | • |
| *Melospiza lincolnii* | Lincoln's Sparrow | | | | | • | • | | | • |
| *Melospiza melodia montana* | Song Sparrow | | | | | | | • | • | |
| *Condestes brammacus* | Lark Sparrow | • | | • | • | • | • | | | • |
| *Amphispiza bilineata deserticola* | Black-throated Sparrow | | | | | | • | | | • |
| *Amphispiza belli nevadensis* | Sage Sparrow | | | | | | • | | | • |
| *Spizella passerina arizonae* | Chipping Sparrow | | | | | | • | • | | • |
| *Spizella breweri breweri* | Brewer's Sparrow | | | | | | • | | | • |

1 Water includes sewage lagoons and overflows, and the playa in the spring when wet.
2 Rare
3 Winter only
4 Migratory

**Table I-4. Bats Captured at DPG During a 1995 Survey.**

| Common Name | Scientific Name |
|---|---|
| Pallid bat | Antrozons pallidus |
| Hoary bat | *Lasiurus cinereus* |
| California myotis | *Myotis californicus* |
| Western small-footed bat | *M. ciliolabrum* |
| Western Pipistrelle | *Pipistrellus hesperus* |
| Townsend's big-eared bat | *Plecotus townsendii* |
| Mexican free-tailed bat | Tadarida brasiliensis |
| Long-eared myotis | *M. evotis*[1] |
| Fringed myotis | *M. thysanodes*[1] |
| Long-legged mytois | *M. volans*[1] |

1 Species captured near DPG lands, and therefore, potentially occurring at DPG.

SOURCE: AGEISS, 1996c

# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX J*

*Cultural Resources Project List at DPG*

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# Cultural Resources Project List at DPG

Appendix J contains information about cultural resource projects conducted at DPG as of January 2000 including the types and numbers of recorded cultural resources in Table J-1, Cultural Resource Projects at DPG.

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**Table J-1. Cultural Resource Projects at DPG.**

| Project Name | Utah State Project Number | Type | Acres Inventoried |
|---|---|---|---|
| Utah State University Archaeology Field School - Dugway Survey 1999 | U-99-UJ-0303m | Recon - Class III | 1,710 |
| Utah State University Archaeology Field School - Testing 1999 | U-99-UJ-0298m(e) | Recon - Research | 0 |
| A Class III Cultural Resource Inventory of the MAAF Assault Strip Support Areas at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0703m | Section 106 - Class III | 22 |
| Site Recordation and Determination of NRHP Eligibility for 42To1186 at U.S. Army Dugway Proving Ground | U-99-DU-0612m | Site - Record & NRHP | 4 |
| A Class III Inventory of the Greenstripping Area Between Little Davis and Little Granite Mountain at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0515m | Section 106 - Class III | 30 |
| Site Recordation and Determination of NRHP Eligibility for 42To959 at U.S. Army Dugway Proving Ground | U-99-DU-0514m | Site - Record & NRHP | 2 |
| A Class III Inventory of the Ditto to Baker Fiber Optics Line at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0419m | Section 106 - Class III | 74 |
| A Class III Inventory of the South Little Granite Greenstripping Area at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0321m | Section 106 - Class III | 95 |
| Archeological Evaluations of Areas Associated with the Gilbert Shoreline and the Old River Bed at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0211m | Section 106 - Class III | 1,992 |
| A Class III Inventory of a Proposed Utah Air NG Road between the Wig Mountain and INF Roads at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0159m | Section 106 - Class III | 10 |
| A Class III Inventory of Telephone Cable Trench on Centerline between Juliet and Delta Roads at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0149m | Section 106 - Class III | Not available |
| A Class III Inventory of the Utah Air NG Road East of Camels Back Ridge at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0138m | Section 106 - Class III | 129 |
| A Class III Inventory of Two Groundwater Monitoring Wells at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0133m | Section 106 - Class III | 1 |
| A Class III Inventory of the Relocation of an AF Target at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0114m | Section 106 - Class III | 133 |
| A Class III Inventory of a Proposed Utah Air NG Road West of Fries Park at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0100m | Section 106 - Class III | 7 |
| A Class III Inventory of a Fiberoptics Cable Between the White Sage Mortar Range CP and the Defensive Test Chamber at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0044m | Section 106 - Class III | 31 |

**Table J-1. Cultural Resource Projects at DPG.**

| Project Name | Utah State Project Number | Type | Acres Inventoried |
|---|---|---|---|
| A Class III Inventory of Test Pits for Potential Borrow Sources for SWMU Caps at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-99-DU-0021m | Section 106 - Class III | 3 |
| Site Recordation of 42 To1000 at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0251m | Site - Record & NRHP | 105 |
| A Class III Inventory of the Devil's Postpile Revegetation Area at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0668m | Section 106 - Class III | 85 |
| A Class III Inventory of two ITAM Revegetation Areas (Five Mile Hill and Wide Hollow) at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0657m | Section 106 - Class III | 167 |
| A Class III Inventory of the ACWA Fiber Optics Cable at an AF facility, U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0507m | Section 106 - Class III | 40 |
| Site Recordation and NRHP Eligibility of Site 42 To1062 at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0389m | Site - Record & NRHP | 1 |
| A Class III Inventory of White Sage Vegetation Rehabilitation at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0388m | Section 106 - Class III | 211 |
| A Class III Inventory of the South Ditto Sand Dunes at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0250m | Recon - Class III | 62 |
| A Class III Inventory of the Proposed Installation of Power on Delta Road, Target 'S' Grid at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0221m | Section 106 - Class III | 23 |
| A Class III Cultural Resources Inventory of the Utah Air NG Headquarters and Communications Sites on South Granite Mountain on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0140m | Section 106 - Class III | 13 |
| A Class III Cultural Resources Inventory of a Proposed Underground Powerline North of Wig Mountain at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0114m | Section 106 - Class III | 13 |
| A Class III Cultural Resources Inventory of a proposed AF target area at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0085m | Section 106 - Class III | 7 |
| A Class III Cultural Resources Inventory of Areas Associated with the X-33 Shuttle Project (NASA) on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0032m | Section 106 - Class III | 838 |
| Geomorphology of the Old River Bed and Delta on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0030m | Geomorphological | 0 |
| Historic Buildings Planning Level Survey at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0029m | Historic Properties Report | 0 |

**Table J-1. Cultural Resource Projects at DPG.**

| Project Name | Utah State Project Number | Type | Acres Inventoried |
|---|---|---|---|
| A Predictive Model for Assessing the Nature and Distribution of Archeological Resources on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-98-DU-0028m | Predictive Model | 0 |
| Utah State University Archaeology Field School - Fremont Ceramics | U-97-UJ-0294m | Recon - Research | 453 |
| Target Preparations for the FAT/LAT Test at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DU-0577m | Section 106 - Class III | 11 |
| Section 106 Inventory of 49 Buildings Proposed for Demolition at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DU-0576m | Section 106 - Building | Not available |
| Maintenance and Repairs at German Village in Preparation for the ACTD Test, U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DU-0471m | Section 106 - Building | Not available |
| Delineation and Assessment of Cultural Resources at Various Locations at U.S. Army Dugway Proving Ground, Tooele County, Utah using LALSR. | U-97-DU-0468m | Recon - Arial Photography | 0 |
| Class III Inventory of a Proposed Fiber Optics Line Between Granite Peak TM and the TM Bore Site Tower on U.S. Army Dugway Proving, Tooele County, Utah | U-97-DU-0467m | Section 106 - Class III | 5 |
| Class III Inventory of Proposed Grounding Rod Locations in Conjunctions with Global Apache 1997 at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DU-0337m | Section 106 - Class III | 7 |
| A Class III Cultural Resources Inventory of Two Proposed Landfills at Baker Strong Point, U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DU-0297m | Section 106 - Class III | 16 |
| LVOSS Test Preparations at Romeo Road and Highway 101 on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DU-0065m | Section 106 - Class III | 14 |
| A Class III Cultural Resources Inventory of the 1996 Little Davis Mountain Burn Area on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-97-DH-0142m | Recon - Class III | 1,216 |
| JDAM JSOW Target | U-96-HL-0303m | Section 106 - Class III | 7 |
| Archeological Investigations at Camels Back Cave (1996-1999) | U-96-DU-0737m(e) | Section 110 - Research | 2 |
| A Class III Cultural Resources Inventory of a Proposed Fiber Optics Cable to the Mini-Mute Sites #9, 4, 8 on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-96-DU-0636m | Section 106 - Class III | Not available |
| A Class III Cultural Resources Inventory of the 1996 North Little Davis Mountain Burn Area on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-96-DU-0622m | Recon - Class III | 207 |

**Table J-1. Cultural Resource Projects at DPG.**

| Project Name | Utah State Project Number | Type | Acres Inventoried |
|---|---|---|---|
| Cultural Resource Inventory of Air Combat Command Mini-Mutes Site Numbers 9,4,8 at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-96-DU-0393m | Section 106 - Class III | 36 |
| Archeological Inventory of Proposed Firing Points West of Granite Peak Mountain, U.S. Army Dugway Proving Ground | U-96-DU-0170m | Section 106 - Class III | 90 |
| Class III Inventory of a Fiber Optic Cable from Wig Launch Site to CALCM Target Area | U-96-DU-0125m | Section 106 - Class III | 53 |
| Intensive Site Recordation and NRHP Eligibility Statement for Black Point (42To860), U.S. Army Dugway Proving Ground, Tooele County, Utah | U-96-DH-0198m | Site - Record & NRHP | 19 |
| A Class III Cultural Resource Inventory of Approximately 7500 Acres in the Wig Mountain Training Area | U-96-DH-0045m | Section 106 - Class III | 7,236 |
| Cultural Resource Management Plan for U.S. Army Dugway Proving Ground, Tooele County, Utah | U-95-WZ-0429m | Management Plan | 0 |
| The Old River Bed Survey: A Class III Cultural Resource and Paleontological Resources Inventory of 2,000 acres on U.S. Army Dugway Proving Ground, Tooele County, Utah | U-95-WZ-0276m | Recon - Class III | 2,007 |
| Construction of a High Energy Cosmic Ray Telescopic Array at the South End of Cedar Mountain at U.S. Army Dugway Proving Ground | U-95-SJ-0455m | Section 106 - Class III | 4 |
| CALCM Target/Pad Enlargement | U-95-HL-0190m | Section 106 - Class III | 1 |
| Mini-MUTE Site ByTPQ39 | U-94-HL-0794m | Section 106 - Class III | 2 |
| Det 3 (777 Radar) Expansion Latrine and Sewage Lines | U-94-HL-0191m | Section 106 - Class III | 6 |
| Cultural Resource Inventory of Proposed Fiberoptic Lines to Existing Cinetheodolite Pads #41 and 42 at U.S. Army Dugway Proving Ground, Utah | U-94-HL-0122m | Section 106 - Class III | 28 |
| From Here to Antiquity: Holocene Human Occupation on Camels Back Ridge, Tooele County, Utah | U-93-UC-0150m | Legacy Project | 0 |
| Cultural Resource Inventory of Proposed Fiberoptic Lines to Existing Cinetheodolite Pads at Wendover AF Range and U.S. Army Dugway Proving Ground, Tooele County, Utah | U-93-HL-0503m | Section 106 - Class III | 45 |
| Cultural Resource Inventory of Proposed Power Line to Air Force Radar Site TPQ 39 on Pad 27 at U.S. Army Dugway Proving Ground, Utah | U-93-HL-0246m | Section 106 - Class III | 98 |
| Mini MUTE Radar Sites at U.S. Army Dugway Proving Ground | U-93-HL-0223m | Section 106 - Class III | Not available |

**Table J-1. Cultural Resource Projects at DPG.**

| Project Name | Utah State Project Number | Type | Acres Inventoried |
|---|---|---|---|
| A Cultural Resource Inventory of Proposed Alternative Power Line Corridors for Utah Power & Light Company for U.S. Army Dugway Proving Ground, Tooele County, Utah | U-92-NP-0034bfmp | Section 106 - Class III | 5 |
| Cultural Resource Inventory of Proposed CALCM Target and Associated Cinetheodolite Pads at U.S. Army Dugway Proving Ground, Utah | U-92-HL-0428m | Section 106 - Class III | 94 |
| Cultural Resource Sample Survey of Potential Electromagnetic Pulse Simulator Site: White Sage Site Area of U.S. Army Dugway Proving Ground, Tooele County, Utah | U-91-SR-0801m | Section 106 - Class II | 111 |
| A Cultural Resources Survey of a Proposed Cosmic Ray Facility and Access Road, U.S. Army Dugway Proving Ground, Tooele County, Utah | U-91-SJ-0824m | Section 106 - Class III | 39 |
| A Class III Cultural Resource Inventory of Habee Antenna Site and Baker Strong Point Gravel Pit | U-90-BC-0543m | Section 106 - Class III | 41 |
| A Class II Archaeological Inventory of a Selected Portion of U.S. Army Dugway Proving Ground in Tooele County, Utah | U-90-BC-0471m | Section 106 - Class III | 803 |
| A Class III Cultural Resource Inventory of One Instrumentation Pad Site, Two Access Roads, a Building/Structure Pad Site, and a General Extension Area on the Northwest and Northeast Side of the Able Area Compound | U-90-BC-0371m | Section 106 - Class III | 94 |
| An Archaeological Inventory of a Proposed New Artillery Range Gun Emplacement and Three Observations Points Near the Cedar Mountain, U.S. Army Dugway Proving Ground | U-90-BC-0225m | Section 106 - Class III | 173 |
| A Class III Cultural Resource Inventory of Two Instrumentation Sites, Two Access Roads, a Structure Pad and Road Improvement Location, and Fuel Storage Area | U-90-BC-0153m | Section 106 - Class III | 42 |
| A Class III Cultural Resource Inventory of Two Movement to Contact (MTC) areas on U.S. Army Dugway Proving Ground, Tooele, County, Utah | U-90-BC-0104m | Section 106 - Class III | 84 |
| Archaeological Surveys of Proposed Excavation Sites Near Wig and Granite Mountains | U-90-BC-0053m | Section 106 - Class III | 71 |
| A Cultural Resources Survey of the Cosmic Ray Observatory at U.S. Army Dugway Proving Ground, Tooele County, Utah | U-89-SJ-0211m | Section 106 - Class III | 67 |
| Cedar Spring Development and Pipeline | U-89-BL-0724bm | Section 106 - Class III | 15 |
| An Archaeological Inventory of Three Borrow Areas Near Wig Mountain, U.S. Army Dugway Proving Ground, Utah | U-89-BC-0597m | Section 106 - Class III | 232 |
| An Archaeological Survey of Two Areas in the Vicinity of Wig Mountain, West-Central Utah, on U.S. Army Dugway Proving Ground | U-87-UA-0582m | Section 106 - Class III | 28 |

**Table J-1. Cultural Resource Projects at DPG.**

| Project Name | Utah State Project Number | Type | Acres Inventoried |
|---|---|---|---|
| A Class II Cultural Resource Inventory of the U.S. Army Dugway Proving Ground, West Central Utah | U-84-MA-1063m | Recon - Class II | 2,021 |

| | | | |
|---|---|---|---|
| ACTD | Advanced Concept Technology Demonstration | LAT | lot acceptance test |
| ACWA | Assembled Chemical Weapons Assessment | MAAF | Michael Army Airfield |
| AF | Air Force | MUTE | Multiple Threat Emitter Systems |
| CALCM | Conventional Air Launched Cruise Missile | NASA | National Aeronautics and Space Administration |
| FAT | final acceptance test | NG | National Guard |
| ITAM | Integrated Training Area Management | NRHP | National Register for Historic Places |
| JDAM | Joint Direct Attack Munitions | SWMU | solid waste management unit |
| JSOW | Joint Standoff Weapon | TM | Technical Manual |
| LALSR | Low Altitude Large Scale Reconnaissance | U.S. | United States |

SOURCE: Callister, 2000c

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR
ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT
U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX K*

*DPG Hazardous Waste Types and Volumes Generated*

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# DPG Hazardous Waste Types and Volumes Generated

Appendix K contains information about the primary hazardous waste types and volumes generated at DPG in 1996, 1997, and 1998. In addition to the waste types, the EPA hazardous waste codes are provided. The EPA hazardous waste codes may apply depending on the chemical characteristics of the material. Hazardous waste information and a list of the DPG groups that typically generate these wastes are presented in Table K-1, Hazardous Waste Types, Generators, and Volumes.

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**Table K-1. Hazardous Waste Types, Generators, and Volumes.**

| Waste Type/EPA Hazardous Waste Code | Waste Description | Generator(s) | Volume Generated (pounds) | | |
|---|---|---|---|---|---|
| | | | 1996 | 1997 | 1998 |
| Charcoal/Carbon filters/D007 | Filters used in face masks that contain ASC Wheterite charcoal filters with chromium are generated as follows:<br>• During test operations<br>• As expiration date is reached | Chemical Test Division | 1,321 | 750 | 27,081 |
| Corrosives/D002 | Corrosive wastes at DPG consist of the following acids and caustics:<br>• Acidic corrosive wastes consisting primarily of battery acid generated occasionally during vehicle maintenance<br>• Caustic corrosive wastes consist primarily of decontamination rinse solutions used to decontaminate chemical simulants<br>• Acids and caustics generated by the various DPG laboratories are addressed under laboratory chemicals | • Chemical Test Division<br>• Division of Installation Support<br>• Air Force Avery Technical Center<br>• Augmentation Contractor<br>• Base Operations Contractor | 3,793 | 1,765 | 2,194 |
| Laboratory chemicals/ Various | • Excess chemicals discarded during routine laboratory tests and analyses<br>• Outdated chemicals or chemicals that do not meet the item's specified quality analysis standard | • Chemical Test Division<br>• Life Sciences Division | 5,005 | 4,062 | 2,703 |

**Table K-1. Hazardous Waste Types, Generators, and Volumes.**

| Waste Type/EPA Hazardous Waste Code | Waste Description | Generator(s) | Volume Generated (pounds) | | |
|---|---|---|---|---|---|
| | | | 1996 | 1997 | 1998 |
| Paints and thinners/ D001, D007, D008 | Paint-related wastes generated from facility painting projects such as:<br>• Flammable paints<br>• Paint residues<br>• Latex paints containing metals such as lead and chromium<br><br>Thinner-related wastes generated from thinning thickened paint, removing paint, and for cleaning the painting accessories such as:<br>• Paint thinners<br>• Lacquer thinners<br>• Mineral spirits<br>• Enamel thinners | • Test Operations Division<br>• Division of Installation Support<br>• Augmentation Contractor<br>• Base Operations Contractor<br>• Housing Area Maintenance Contractor | 908 | 2,640 | 2,685 |
| Photo processing chemicals/D011 | Generated during x-ray and photo-developing operations if silver recovery is not effective or not used | • Test Operations Division<br>• Air Force Avery Technical Center<br>• Health Clinic | 326 | 0 | 548 |
| Solvents/ F001 through F005, D001 | • Solvents used primarily for cleaning and maintenance activities<br>• Solvents used by laboratories for preparing solutions required for analytical tests<br>• Result from inability to recycle solvents | • Chemical Test Division<br>• Life Sciences Division<br>• Test Operations Branch<br>• Meteorology and Obscurants Division<br>• Plans and Operations Division-Michael Army Airfield<br>• Division of Installation Support<br>• Air Force Avery Technical Center<br>• Health Clinic<br>• Augmentation Contractor<br>• Base Operations Contractor | 1,141 | 1,879 | 5,790 |

**Table K-1. Hazardous Waste Types, Generators, and Volumes.**

| Waste Type/EPA Hazardous Waste Code | Waste Description | Generator(s) | Volume Generated (pounds) | | |
|---|---|---|---|---|---|
| | | | 1996 | 1997 | 1998 |
| Flammables/D001 | Waste solvents from DPG operations | • Lockheed<br>• Environmental Programs | 85 | 220 | 14 |
| Petroleum, Oils, and Sludges/D001, D008, D018, F003, F005 | Waste petroleum products and oil from DPG operations | • Avery Technical Center<br>• Griffen-Albers<br>• Housing<br>• Chamber Tests<br>• Environmental Programs | 3,448 | 8,503 | 7,709 |

DPG U.S. Army Dugway Proving Ground
EPA U.S. Environmental Protection Agency

SOURCES: DPG, 1996g; DPG, 1997h; DPG, 1998d

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# FINAL ENVIRONMENTAL IMPACT STATEMENT FOR ACTIVITIES ASSOCIATED WITH FUTURE PROGRAMS AT U.S. ARMY DUGWAY PROVING GROUND

*APPENDIX L*

*Distribution List*

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# Distribution List

Appendix L presents a list of individuals, agencies, and organizations that received the Final Future Programs EIS or an Executive Summary. This Future Programs EIS distribution list was developed as part of the Public Affairs Plan developed for this EIS (AGEISS, 1996f). It was compiled from a database that was updated throughout the EIS process. Addressees were directed that they would receive an Executive Summary unless they specifically requested a full version of the EIS. Those on the distribution list who requested a full EIS could choose to receive a 1,000-page print version or an electronic copy.

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### Academic Institutions/Professional Organizations

Bureau of Microbiology
Chemical and Biological Warfare Project SIPRI
Division of Gastroenterology
State University of New York, Natural Sciences
SPRU-Science and Technology Policy Research, University of Sussex
The Center for International and Strategic Studies at Maryland (CISSM)
University of Wisconsin Office of Biological Safety
Utah Cattlemens Association
Utah Valley State College Dept of Env Technology

### Businesses and Business Groups

Air Chemical Lab
Alliant Tech Systems
Aptus Western Environmental Services
Basin Land and Livestock
Bastelle
Bechtel
Booz Allen & Hamilton, Inc.
Broken Arrow Inc
BSA Environmental Services
CDM Federal Programs Corporation
Chamber of Commerce, Stansbury Park
Chevron USA Inc
Ebasco Environmental
ECI
Eckoff Watson and Preator
EG&G Defense Materials Inc, Chemical Demilitarization Project
Envirocare of Utah
Ernie Owens Battelle
Flying J Inc
Hammer, Siler, George Associates
Hanford Nuclear Services, Inc.
Higginbotham/Briggs & Associates
Innovative Technical Solutions, Inc.
Holme Roberts and Owen
ISRI
Job Service
Kennecott Utah Copper
Kleinfelder
Los Alamos Technical Associates
McFarland and Hullinger
Meridian Oil Inc, Safety Env Dept
Safety Kleen
SAIC
Stoel Rivers Boley Jones and Grey
The Mangi Environmental Group
Tooele County Chamber of Commerce
Tooele County Economic Development Corporation
USPCI
USPCI CIF
Utah Manufacturers Association
VJ Environmental

### Citizen Action Groups

Citizen Alert
Citizens Call
Citizens Education Project
Millard County Concerned Citizens
Rural Alliance for Military Accountability
The Sunshine Project

### City Government Agencies

Tooele Fire Department
Tooele Police Department
Wendover City

### Civic and Community Groups

American Association of University Women, Tooele
American Legion Auxiliary, Tooele
American Legion Post 17, Tooele
American Lung Association of Utah, Salt Lake City
Business and Professional Women, Tooele
Council of the Arts, Tooele
Daughters of Utah Pioneers, Tooele
Democratic Party, Stansbury Park
Eagles Auxiliary, Tooele
Eagles Lodge, Tooele
Elks Lodge and Auxiliary, Tooele
Emergency Medical Technician Association, Tooele
Four H Club, Tooele
Gem and Mineral Club, Tooele
Grantsville City Beautification League
Grantsville Lions Club
Grantsville Senior Citizens
Grantsville Volunteer Fire Dept
Kiwanis Club, Tooele
LDS Relief Society, Erda
League of Women Voters, Holladay
Loyal Order of the Moose and Women of the Moose, Tooele
Republican Party, Tooele
Senior Citizens, Tooele
Sons of Utah Pioneers, Grantsville
Sons of Utah Pioneers, Tooele
Tooele BPW, Grantsville
Tooele City Volunteer Fire Dept and Auxiliary
Tooele Civic League
Tooele County Centennial Committee
Tooele County Democratic Party
Tooele County Historical Society
Tooele County Republican Party
Tooele County Senior Citizens
Tooele Methodist Church
Tooele Valley Kiwanis Club
Travelers Aid Society, Salt Lake City
Womans Club of Tooele

**County Government Agencies**

Salt Lake County Fire Emergency Services Bureau
Tooele County Dept of Emergency Management
Salt Lake County Department of Fish and Game
Salt Lake County Health Department
Tooele County
Tooele County Attorney
Tooele County Health Department
Tooele County Sheriff Patrol
Tooele Valley Recycling Board
Utah County Emergency Management

**EIS Points-of-Contact**

Air Force Contacts

Major Andre McAfee, 388th RANS Ground Support
Mr Marcus J Teters, 388th RANS Ground Support
Mr Sam Johnson, 388th RANS/AM
Ms Myra Tams, 388th RANS/AM
Ms Kay Winn, Environmental Management Directorate

Cosmic Ray Contacts

Mr John N Matthews, University of Utah Dept of Physics and Institute for High Energy Astrophysics

Dugway Contacts

Mr Scott Reed, Installation Restoration Program Manager
Ms Shayes Turley, Chamber Test Facility West Desert Test Center
Dr Robert J Radel, Chemical Test Division
Mr Wayne Rindlisbacher, Counter Intelligence
Ms Kathleen Callister, Directorate of Environmental Programs
Mr John Woffinden, Directorate of Environmental Programs
Mr RJ Black, ECRT
Mr Bud Ford, NEPA Coordinator, Environmental Programs
Mr James H Wheeler, Environmental Technology Office
Mr Steve Klauser, Environmental Technology Office
Mr Ralph Haddock, Joint Contact Point Office
Dr Alan J Mohr, Life Sciences Division
Mr Stephen Parker, Life Sciences Division
Mr James Bowers, Meteorology & Obscurants Division
Dr George Lemire, Obscurants & Environmental Test Group
Mr Martin Marshall, Obscurants & Environmental Test Group
Ms Paula Nicholson, Public Affairs Office
Dr Mike Glass, Special Programs Office
Mr Charles Dewitt, Test Operations Division
LTC Christopher Rasmussen, Commander, West Desert Test Center
Colonel Gary Harter, Commander, US Army Dugway Proving Ground
Mr Joseph R Gearo, Director of Environmental Programs
Mr Jack Skeen, Command Judge Advocate

NASA Contacts

Mr Lee Musselman, Hill Air Force Base, 388 RANS – DOO
Dr Rebecca C McCaleb, Marshall Space Flight Center Environmental Engineering and Management Office
Ms Janis Graham, NASA Jet Propulsion Laboratory
Mr Kenneth Kumor, NASA

National Guard Contacts

Major Ted Frandsen, Utah National Guard
Melanie Walton, Utah National Guard

**Elected Government Officials**

City/Town Councils

Grantsville City Council
Stockton City Council
Tooele City Council
Rush Valley Town Council

Community Association Presidents

Terra Community Association

County Commissioners

Tooele County Commissioners

Governor of Utah

The Honorable Michael O Leavitt

Mayors

Mayor of Salt Lake City
Mayor of Grantsville
Mayor of Wendover
Mayor of Tooele
Mayor of Rush Valley
Mayor of Ophir
Mayor of Stockton
Mayor of Vernon

School Superintendents

Tooele County School District

United States Representatives

The Honorable Rob Bishop
The Honorable James Mattheson
The Honorable Chris Cannon

United States Senators

The Honorable Robert F Bennett
The Honorable Orrin G Hatch
The Honorable John H Chasee
The Honorable Edward M Kennedy

Utah State Representatives

The Honorable Douglas Aagard
The Honorable Stuart Adams
The Honorable Jeff Alexander
The Honorable Sheryl L Allen
The Honorable Eli H Anderson
The Honorable Roger Barrus
The Honorable Ralph Becker
The Honorable Chad E Bennion
The Honorable Jackie Bickupski
The Honorable Ron Bigelow
The Honorable Calvin G Bird
The Honorable Duane Bourdeaux
The Honorable Demar "Bud" Bowman
The Honorable Katherine M Bryson
The Honorable Judy Ann Buffmire
The Honorable Don E Bush
The Honorable Craig W Buttars
The Honorable Gregg D Buxton
The Honorable LaVar Christensen
The Honorable Stephan Clark
The Honorable David Clark
The Honorable David N Cox
The Honorable Greg J Curtis
The Honorable Scott Daniels
The Honorable Margaret Dayton
The Honorable Brad L Dee
The Honorable Marda Dillree
The Honorable Glen Donnelson
The Honorable John Dougall
The Honorable Carl W Duckworth
The Honorable James A Dunnigan
The Honorable James Ferrin
The Honorable Ben Ferry
The Honorable Brent H Goodfellow
The Honorable James R Gowans
The Honorable Neil Hansen
The Honorable Ann W Hardy
The Honorable Wayne A Harper
The Honorable Neal B Hendrickson
The Honorable David L Hogue
The Honorable Kory M Holdaway
The Honorable Gregory H Hughes
The Honorable Eric Hutchings
The Honorable Bradley T Johnson
The Honorable Patricia Jones
The Honorable Brad King
The Honorable Todd E Kiser
The Honorable Bradley G Last
The Honorable Susan Lawrence
The Honorable David Litvack
The Honorable Rebecca Lockhart
The Honorable Dana C Love
The Honorable Steven Mascaro
The Honorable Ty McCartney
The Honorable Rosalind J McGee
The Honorable Karen W Morgan
The Honorable Michael T Morley
The Honorable Joseph G Murray
The Honorable Merlynn Newbold
The Honorable Michael E Noel
The Honorable Loraine T Pace
The Honorable Darin Peterson
The Honorable Morgan Philpot
The Honorable Jack A Seitz
The Honorable LaWanna Shurtliff
The Honorable Gordon Snow
The Honorable Carol Spackman Moss
The Honorable Martin R Stephens
The Honorable Michael R Styler
The Honorable Mike Thompson
The Honorable David Ure
The Honorable Stephen Urquhart
The Honorable Peggy Wallace
The Honorable Curt Webb
The Honorable Bradley Winn

Utah State Senators

The Honorable Ron Allen
The Honorable Patrice Arent
The Honorable Gregory Bell
The Honorable Leonard M Blackham
The Honorable Curtis S Bramble
The Honorable D Chris Buttars
The Honorable Gene Davis
The Honorable Mike Dmitrich
The Honorable Dan R Eastman
The Honorable Beverly A Evans
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The Honorable David Gladwell
The Honorable Karen Hale
The Honorable Thomas Hatch
The Honorable Parley Hellewell
The Honorable John W Hickman
The Honorable Lyle W Hillyard
The Honorable Scott K Jenkins
The Honorable Paula F Julander
The Honorable Peter C Knudson
The Honorable L Alma "Al" Mansell
The Honorable Ed P Mayne
The Honorable David H Steele
The Honorable Howard A Stephenson
The Honorable Dave L Thomas
The Honorable John L Valentine
The Honorable Michael G Waddoups
The Honorable Carlene M Walker
The Honorable Bill Wright

**Environmental Groups**

Audubon Council of Utah
Defense of Utah Streams & Environment
Great Salt Lake Audubon Society
National Audubon Society
National Wildlife Federation
National Wildlife Fund
The Sierra Club, Utah Chapter
Tooele County Wildlife Federation
Trout Unlimited
Utah Audubon Society

Utah Wildlife Federation
Wasatch Mountain Club Conservation Committee

### Federal Government Agencies

902d Military Intelligence Group, Fort Carson
AFMIC Medical Intelligence Center
Army National Guard Utah State Headquarters
Bureau of Reclamation Ecological Planning and Assessments
Centers for Disease Control & Prevention National Center for Environmental Health
Deseret Chemical Depot
CSTE-DTC-EQ, Aberdeen Proving Ground
Division of Env Protection
Eglin AFB, FL
Engineering Field Activity, Northwest – Naval Facilities Engineering
Eno Health Division
Federal Energy Regulatory Commission
Great Basin National Parks
NAVSEA Keyport
Senate Environment Committee
Tooele Army Depot
US Army Environmental Law Division
HQ AFOTEC/Det 1/SAIC
US Army Materiel Command AMCSU
USAMC Installations and Services Activity Rock Island Arsenal
US Army, TACOM-ARDEC Systems Readiness Center
US Army Test & Evaluation AMSTE TA T
US Army Test & Evaluation Command
US Army White Sands Missile Range
US Department of Agriculture State Conservation Office
US Department of the Air Force
US Department of Energy (EH-42), Office of NEPA Policy and Compliance
US Department of the Interior Bureau of Indian Affairs, Fort Duchesne, UT
US Department of the Interior Bureau of Indian Affairs, Phoenix, AZ
US Department of the Interior Fish and Wildlife Service
US Department of the Interior Office of Environmental Policy and Compliance
US Department of the Interior Bureau of Land Management
US Department of the Interior Fish and Wildlife Service
US Environmental Protection Agency Region 8
US Environmental Protection Agency Region 8, NEPA Program Office
US Fish and Wildlife, Utah Field Office
US Forest Service

### Individual Citizens

Mr & Mrs John & Marsha Martin
Mr & Mrs James & Tina Wheeler
Mr Thomas D Adams
Mr Peter Allan
Mr Duane Allen
Ms Ruth E Anderson
Mr Dean Armstrong
Ms Trettis M Arvizo
Mr Thomas R Atkin
Mr Jimmie Barnett
Mr and Mrs Dave and Roni Barton
Mr William T Barton
Mr Vernon Bennett
Mr David Bickmore
Mr Gary Bodily
Ms Jean D Braun
Mr Glen E Brown
Mr Melvin R Brown
Mr Edward L Brown
Mr H A Bryson
Mr Norman A Bunn
Mr Charles Burhoe
Mr Scott Carrier
Mr George A Carruth
Mr Arnold Christensen
Mr Vern M Clary
Mr Bruce Clegg
M A Croom
Mr Duane Crossley
Mr and Mrs Lavell and Kathy Cummings
Mr Theran Davis
Mr Jim Denier
Mr Vernon Denman
Mr James Doenges
Mr Alton Dugas
Mr Brent Eggett
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Mr Charles Gladden
Mr Gerald E Gordon
Kelly H Gubler
Doug & Brandee Guild
Mr Jerry Henson
Kris Hill
Mr Lyle W Hillyard
Ms Celestia Himstreet
Ms Kay Hoffman
Mr Leland Hogan
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Ms Christy P Kane
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Mr Ira C Sly
Mr Buddy R Smith
Ms Gayle Stevenson
Ms Joyce Stromberg
Mr Mark Struthwolf
Mr Karl G Swan
Ms Renee M Tanner
Ms Lynn Taylor
Kendall Thomas
Ltc Woodrow J Till
Dr PhJ. Van Dalen
W Shane Van Roy
Mr Thomas Ware
Mr Richard Warner
Mr Paul Wayman
Ms Beverly J White
Mr Ferris Williams
Ms Leuretta Wilson
Mr Henry Yeates MD
Mr Michael Lefevre

**Libraries**

Salt Lake City Main Library

Public Reading Rooms

DPG Public Library
Tooele City Library
University of Utah J Willard Marriott Library 5th Floor
Whitmore Library

**Media**

Newspapers

Catalyst Magazine
Chemical & Engineering News
Chicago Tribune – Denver Branch
Deseret News
Desert Star
Magna Times
Millard County Chronicle
National Journal
Salt Lake City Tribune
The Daily Herald
The Herald Journal
The Wall Street Journal
Tooele Transcript Bulletin
US News & World Report

Radio Stations

KCPX AM KCPX FM
KPCW FM
KRSP AM KRSP FM
KSL AM 1160 CBS
KSOP AM KSOP FM
KTKK AM ABC
KUER FM NPR
KUSU FM News
KUTR AM KLTO FM
KZNS AM, KSFI FM

Television Stations

KBYU TV Channel 11 Brigham Young Univ
KJZZ Channel 14
KSL TV Channel 5 NBC
KSTU Channel 13
KTVX TV Channel 4 ABC
KUED TV Channel 7
KULC Channel 9
U TV Channel 2 CBS

**Miscellaneous**

TU Council
Wasatch Front Regional Council

### Native American Tribes

Ute Mountain Tribe of the Ute Mountain Reservation
Battle Mountain Band Council Western Shoshone Indians of Nevada
Duckwater Shoshone Tribal Council Duckwater Shoshone Tribe
Elko Band Council Western Shoshone Indians of Nevada
Ely Colony Council Ely Shoshone Tribe
Fort Hall Business Council Shoshone-Bannock Tribes of the Fort Hall Reservation
Goshute Business Council Confederated Tribes of the Goshute Reservation
Shoshone Business Council Shoshone Tribe of the Wind River Reservation
Shoshone Paiute Business Council, Shoshone Paiute Tribes of the Duck Valley Reservation
Skull Valley Reservation Skull Valley Band of Goshute Indians
South Fork Band Council
Western Shoshone Indians of Nevada
Tribal Council of the Te Moak Western Tribes, Te Moak Tribes of the Western Shoshone Indians
Uintah and Ouray Tribal Business Council, Ute Indians of the Uintah and Ouray Reservation
Wells Indian Colony Band Council Western Shoshone Indians of Nevada

### State Government Agencies

State of Utah Governor's Office
State of Utah Dept of Health, Bureau of Epidemiology
State of Utah Office of Planning & Budget
State of Utah Division of Comprehensive Emergency Management
State of Utah
State of Utah Office of Planning and Budget
State of Utah Division of Environmental Health
Utah Army National Guard, Utah State Headquarters
Utah Attorney General Natural Resources Division
Utah Attorney General Environmental Division
Utah Community & Economic Development Division of Indian Affairs
Utah Department of Health, Office of the Executive Director
Utah Department of Natural Resources Wildlife Resources
Utah Department of Natural Resources Administration
Utah Department of Natural Resources Forestry Fire & State Lands
Utah Department of Natural Resources Geological Survey
Utah Department of Natural Resources Parks and Recreation
Utah Department of Natural Resources Water Resources
Utah Department of Public Safety Utah Highway Patrol
Utah Department of Environmental Quality
Utah Department of Environmental Quality Division of Radiation Control
Utah Department of Environmental Quality Division of Solid & Hazardous Waste
Utah Department of Environmental Quality Division of Drinking Water
Utah Department of Environmental Quality Division of Air Quality
Utah Department of Environmental Quality Division of Environmental Response and Remediation
Utah Department of Environmental Quality Division of Water Quality
Utah National Guard Environment
Utah DOH

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